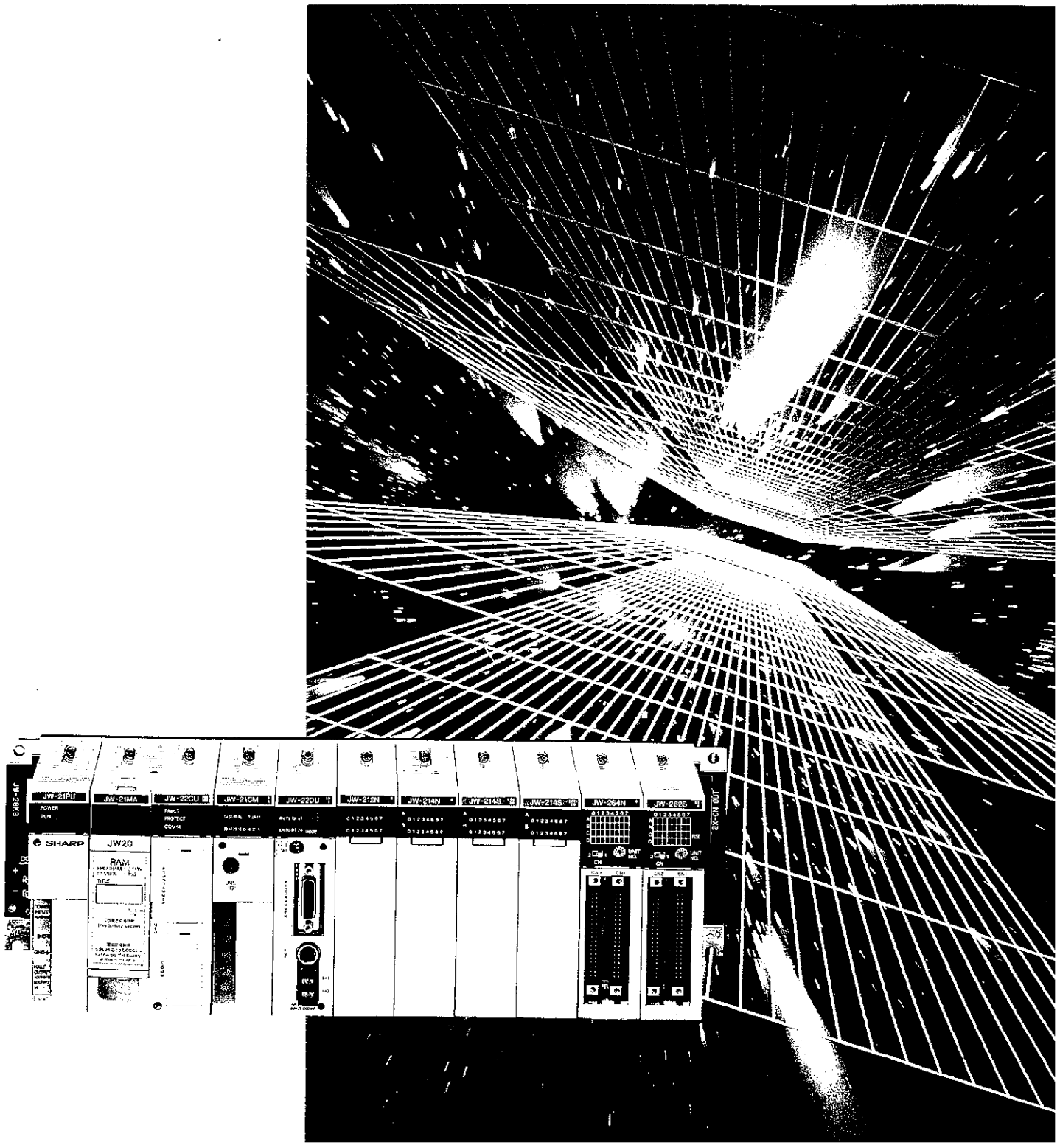
SHARP

Version 1.7
Produced in May 1998

Sharp Programmable Controller

New Satellite *JW20H*

User's Manual · Hardware version



We thank you for your purchase of the SHARP programmable controller JW20H.
This booklet (user's manual, hardware version) explains mainly the JW20H's hardware; the system configuration, specifications, installation method etc.
Carefully read this user's manual, hardware version so that you are able to operate JW20H properly, having thoroughly familiarized yourself with the functions of the system module and their operation method.
Keep this user's manual, hardware version.
We are confident that these booklets will be helpful whenever you face problem.
Please refer to the programming manual ladder instruction version or programming manual.

Note

- This module is made in accordance with Japanese domestic specifications. Its guarantee clauses are described in a separate guarantee card (packed together with the module). When this module is used outside Japan, these guarantee clauses are not applicable. In addition, the guarantee should be understood as a guarantee of the delivered product as a single unit and every other damages or losses due to damage or malfunction of the product will not be included in this guarantee.
- Should you have any questions and inquiries, please feel free to contact our dealers.
- The whole or partial photocopy of this booklet is prohibited.
- Contents of this booklet may be revised for improvement without notice.

Safety precautions

Read this manual and attached documents carefully before installation, operation, maintenance and checking in order to use the machine correctly. Understand all of the machine knowledge, safety information, and cautions before starting to use. In this instruction manual, safety precautions are ranked into "danger" and "caution" as follows.

Danger : Wrong handling may possibly lead to death or heavy injury.

Caution : Wrong handling may possibly lead to medium or light injury.

Even in the case of Caution, a serious result may be experienced depending on the circumstances. Anyway, important points are mentioned. Be sure to observe them strictly.

The picture signs of Prohibit and Compel are explained below.

: It means don'ts. For example, prohibition of disassembly is indicated as ( ).

: It means a must. For example, obligation of grounding is indicated as ( ).

1) Installation

Caution

- Use in the environments specified in the catalog and instruction manual.
  Electric shock, fire or malfunction may be caused when used in the environments of high temperature, high humidity, dusty or corrosive atmosphere, vibration or impact.
- Install according to the manual.
  Wrong installation may cause drop, trouble or malfunction.
- Never admit wire chips or foreign matter
  Or fire, trouble or malfunction may be caused.

2) Wiring

Compel

- Be sure to ground.
  Unless grounded, electric shock or malfunction may be caused.

Caution

- Connect the rated power source.
  Connection of a wrong power source may cause a fire.
- Wiring should be done by qualified electrician.
  Wrong wiring may lead to fire, trouble or electric shock.

3) Use

⚠ Danger

- Don't touch the terminal while the power is being supplied or you may have on electric shock.
- Assemble the emergency stop circuit and interlock circuit outside of the programmable controller. Otherwise breakdown or accident damage of the machine may be caused by the trouble of the programmable controller.

⚠ Caution

- "Run" or "stop" during operation should be done with particular care by confirming safety. Misoperation may lead to damage or accident of the machine.
- Turn ON the power source in the specified sequence. Turn ON with wrong sequence may lead to machine breakdown or accident.

4) Maintenance

⚠ Danger

- Never connect battery in wrong polarity, or charge, disassemble, heat, throw into fire, or short-circuit. Or it may be broken or ignited.
- Do not subject the battery to impact of any kind. Do not pull on the lead wires of the battery, or liquid leakage accident may occur.

Prohibit

- Don't disassemble or modify the modules.
  Or fire, breakdown or malfunction may be caused.

⚠ Caution

- Turn OFF the power source before detaching or attaching the module.
  Or electric shock, malfunction or breakdown may be caused.
- Replace with the fuses in specified ratings only.
  Or fire, breakdown may be caused.

Programmable controller

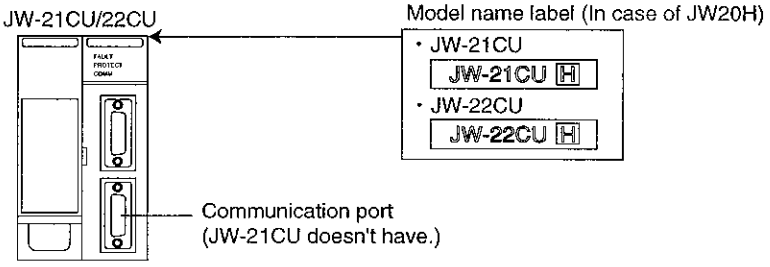
New satellite *JW20H*

- User's manual hardware version-

Table of contents

Chapter 1. Overview

The new programmable controller satellite JW20H (hereafter referred to as the JW20H) reduces the mnemonics processing time and can process instructions at approximately twice the speed of the original JW20. The same modules can be used to configure a system (such as a memory module) for either the JW20H or the JW20. The JW20H is a compact and highly functional programmable controller which is capable of controlling 64 to 512 input/output points.
The JW20H has a mark of [H] in model name label of control module (JW-21CU/22CU).



■ Features

1. High-density package made possible by the exclusive LSI circuit. Extension of the I/O bus and less wiring because of the I/O link.

- High-density package brings the advantages of small installation area and short depth. It facilitates smaller control panels and equipment.
- The I/O expansion cable can be extended up to 14m in length without time delay.
- A dedicated exclusive satellite I/O link area (512 points) is provided so that up to 4 I/O links can be connected without decreasing the number of I/O points.

2. Considerably improved design, debugging efficiency, and maintenance ease based on its Step Flow instruction.

- Shortened programming time by inputting program according to a machine's operational sequence.
- Structured program greatly shortens debugging time.
- The operation step monitor function is useful to investigate causes when trouble occurs.
- The Step Flow instruction is easily programmed using the programmer JW-12PG/13PG, JW-2PG, and JW-50PG).

3. Available symbol entry and display by program.

- The memory module has a symbol registration area so that symbols (alphabetical and 6 kana characters) can be allocated for coils and relays.
- While monitoring programs and data, the symbols are displayed. Efficient for checking total systems.
- An error message automatically appears when an abnormal condition of the JW20H occurs.
- Registerable 768 symbols for the JW-21CU, 1024 symbols for the JW-22CU. Registration of symbols on ROM is also available.

4. Integrated multi-functions of upper grade models.

- 0.54 μ S processing speed for basic instructions. The same as those of upper grade models. Interruption processing is available, too.
- Using the link module, the communication network, including the host device, is available. The network hierarchy is easily attainable.
- 20 basic instructions and 113 application instructions easily execute data processing.
- A personal computer can be connected through the communication port of the basic system only (JW-22CU).
- Clock feature is available with the installed timer function (JW-22CU).

Chapter 2. Safety precautions

Installation

Avoid keeping the JW20H in the following conditions:

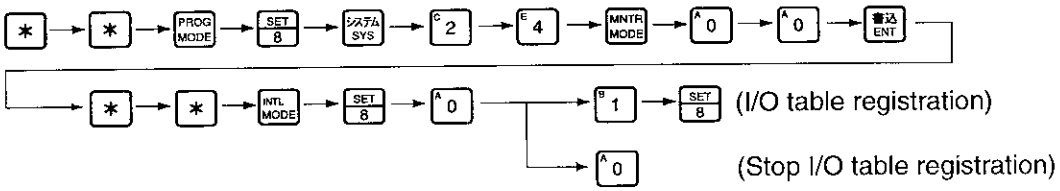
- Direct sunlight, ambient temperatures below 0℃ to 55℃ (below -20 to 70℃ during storage.)
- Relative humidity which exceeds 35 to 90 %. No condensation due to rapid temperature variation.
- Corrosive and flammable gases.
- Vibration and shock producing and transferring obstacles.

Operation

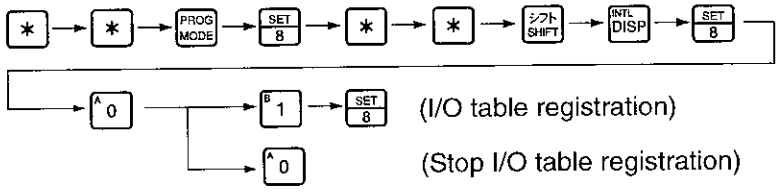
1.Prepare an emergency stop circuit at the external relay circuit, and connect the halt output from the JW20H.

2. Register the I/O table prior to operation of the JW20H (re-operation after exchanging modules), otherwise the JW20H can not be started. By registering the I/O table and the types of modules, allocated relay numbers in each rack number and slot number are registered. Proceed using the following process for I/O table registration.

・Operation on the JW-2PG



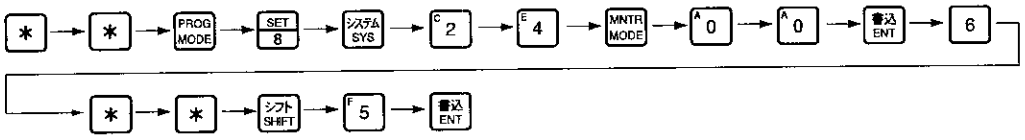
・Operation on the JW-11PG/12PG/13PG



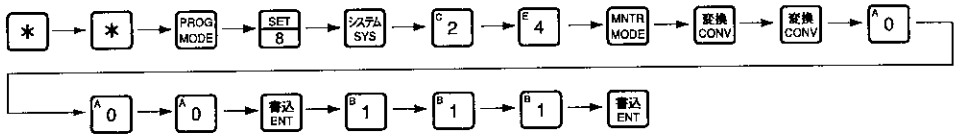
・Operation on the JW-50SP, JW-40PG, and JW-50PG

Main menu → Transfer to PC → I/O table creation

・Operation on the JW-10PG



・Operation on the ZW-101PG1



・JW-30PG/32PG, Z-100SP2S (Installed in expansion module : Z-3LP2EM)

Read system memory #024	→	Read 6F by hexadecimal or 111 by decimal	→	Transfer to PC

3.Before installing a battery in the memory module, be aware of its validity. Replace it with a new one which has the required validity.

4.Keep supplying power when you exchange backup batteries. Otherwise, you may loose programs in RAM.

5.Prepare necessary maintenance parts such as batteries and fuse elements, in advance.

6.Be careful not to operate the switches and connector fitting with excessive strength.

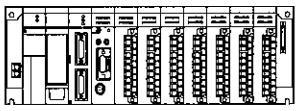
■ Grounding

Prepare a class-3 grounding of the JW20H separately. Never co-ground with high power equipment grounding lines.

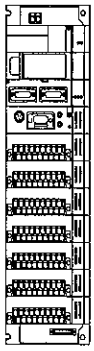
■ Installation

- Securely fasten the retaining screws in each module, and confirm again that it is fastened prior to supply power. Looseness of screws may cause malfunction.
- Firmly connect cable (I/O expansion cable), connecting to the basic/expansion rack panel. Confirm connectors are fastened prior to supplying power. Looseness may cause malfunction.
- Each module has a ventilation hole to allow for cooling. Do not block the holes.
- Install the JW20H horizontally against a control panel (parallel, wall-mount installation), otherwise (vertical, wall-mount installation) temperature increase may occur.

Good; Parallel, wall-mount installation



No good; Vertical, wall-mount installation



■ Wiring

- When power is supplied to the power supply module of the basic rack panel, "RUN" indicator lamp of the power supply module lights. When "FAULT" indicator lamp of the control module lights, an error code "43" (expansion power supply error) is registered in the system memory #160 and the JW20H stops operation. In this case, supply power to the power supply module of the expansion rack panel.
- Be aware not to cross the connection polarity of 5 VDC on the basic/expansion rack panel. Otherwise, rack panel and I/O module etc. may be damaged.
- Keep the input/output lines away from high voltage or strong current lines such as power lines.

Cautions for static electricity

Significant volume of static electricity may build up on the human body in extremely dry conditions. Prior to touching the JW20H, discharge the static electricity by touching grounded metals.

Cleaning

Use the soft cloths for cleaning. Volatile solvents (alcohol, paint thinner, freon etc.) and wet rags may cause deformation or change of color.

Storage

Keep the memory module in cool and dry conditions as it equipped with a battery for memory backup.

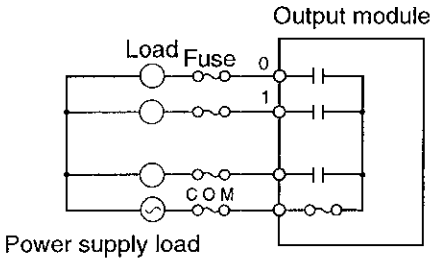
High ambient temperature may shorten its battery life.

Do not keep the JW20H laid in face down or put other objects on the JW20H.

Short circuit protection

If the load connected to the output terminal shorts circuits, the output device or the printed circuit board may burn. Insert a protective fuse in the output line.

We recommend to installing protective fuses for each line, even if external devices have fuses for each common unit. These common line fuses are to protect burn-out of the device caused by overload, and do not for protect against overcurrent of output device and load.



Insulation transformer

Choose the insulation transformer of the capacity of more than 20% upper than that of the rated load. When a transformer of the same capacity as that of the rated load is used, a primary input voltage might exceed the transformer rated capacity.

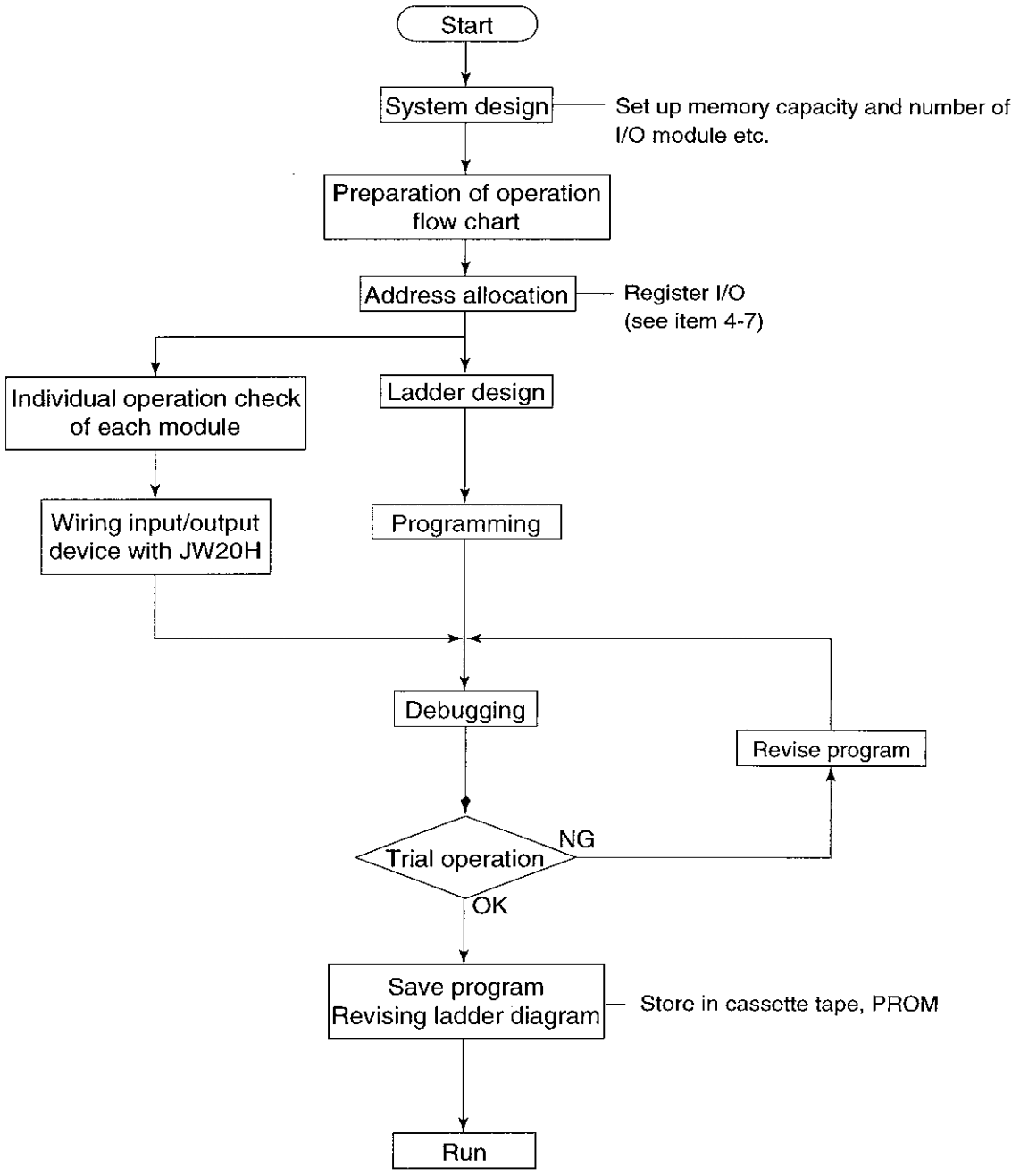
In case of JW20H, use the insulation transformer of the capacity of more than 72VA.

Power supply module	Power consumption	Using the capacity of transformer
JW-21PU	60VA or less (Maximum load state of module of power supply module 1)	72VA or more
JW-22PU		
JW-31PU		

Chapter 3. System Design and Specifications

3-1. System Design Procedure

The system design procedure is virtually as the same as those of the other conventtional relay controllers. The following is an example of the system design procedure of the JW20H.



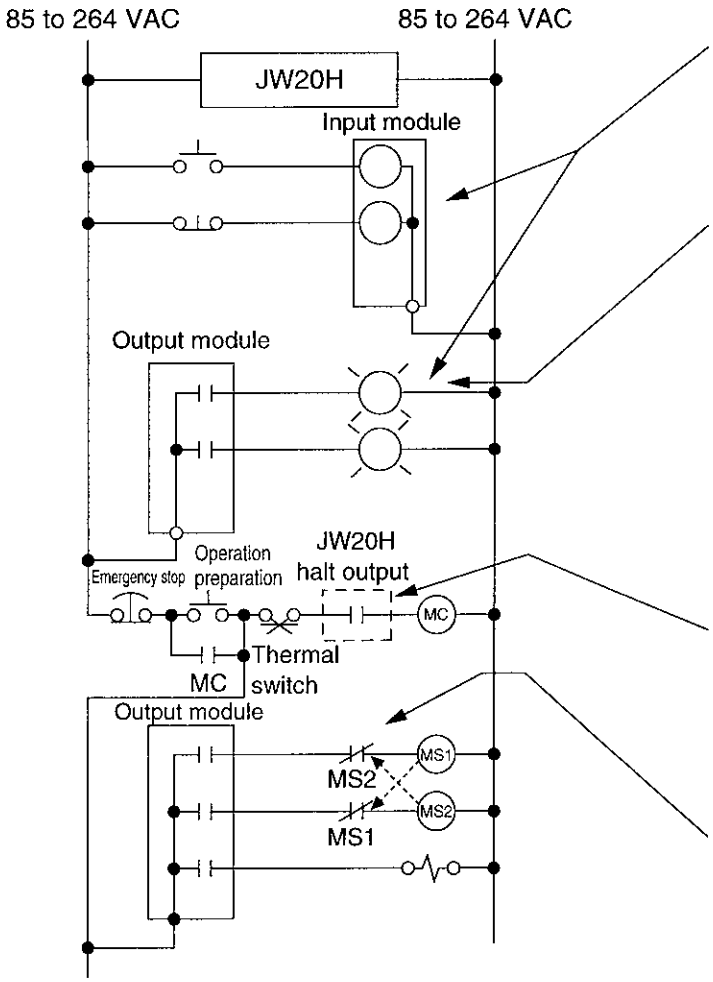
3-2. Cautions on System Design

A principle difference between a programmable controller (PC) and a conventional relay circuit is that a PC controls each operation cyclically (in series), whereas relay circuit controls it in parallel. Therefore, relay circuits limit the effect of an abnormal operation to a block.
However, a PC allows abnormal operations of the whole system when an abnormal condition occur. In order to create a fail-safe system, we recommend preparing independent external protective circuits for following functions, which may cause a breakdown of machine or injury to workers:

- Emergency stop circuit,
- Protection circuit,
- Operating circuit of high voltage device.

Also, be aware of the operation response time, as a PC operates using cyclic processing.
To prevent mis-operation due to output signal of the output module soon after switching on power to the JW20H, connect in series the halt output for the JW20H in the following operation stand-by circuit. (The stop output switches on approx. 1 sec. after supplying power to the JW20H)

· In case of using AC power supply

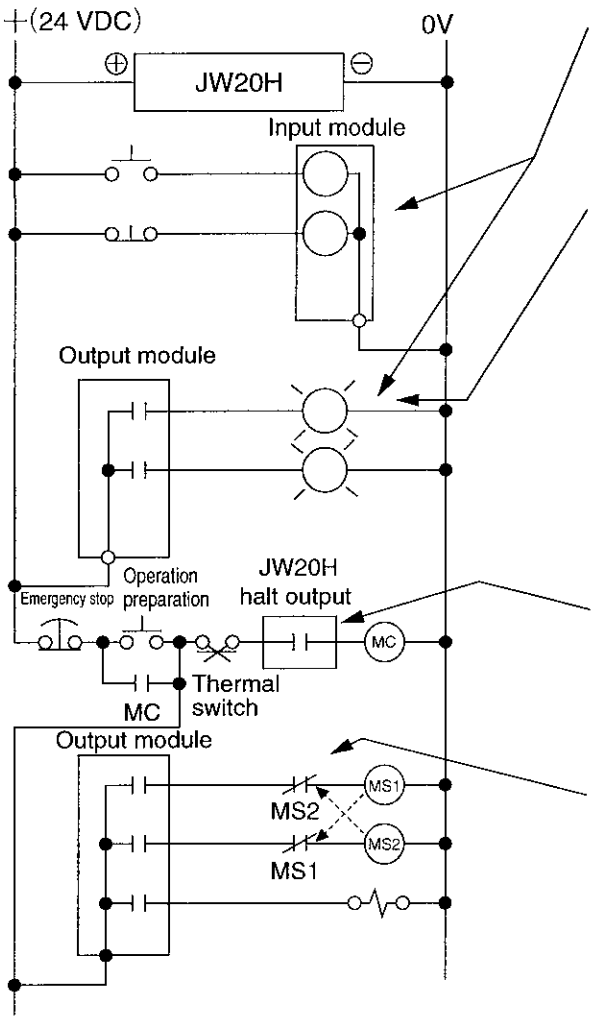


- Connecting the input module and output module for lighting lamps in front of emergency stop circuit makes it possible to grasp the stop condition of devices.

- When the JW20H stops its operation, all the output module indicate ON/OFF condition just before stopping.
  Note: When setting an output holding address in the system memory, all the output after the setting address is retained and you can reset the previously set address.
  (only available when power is supplied to the JW20H.)

- Halt output
  (Relay output 100/200 VDC, 30 VDC,1A)

- Interlock circuit
  Prepare external interlock circuit to prevent reverse operation, damage of machines and injury of workers.
  Note: When DC output module is used as a output module, use AC relay and install its contact in the emergency stop circuit.

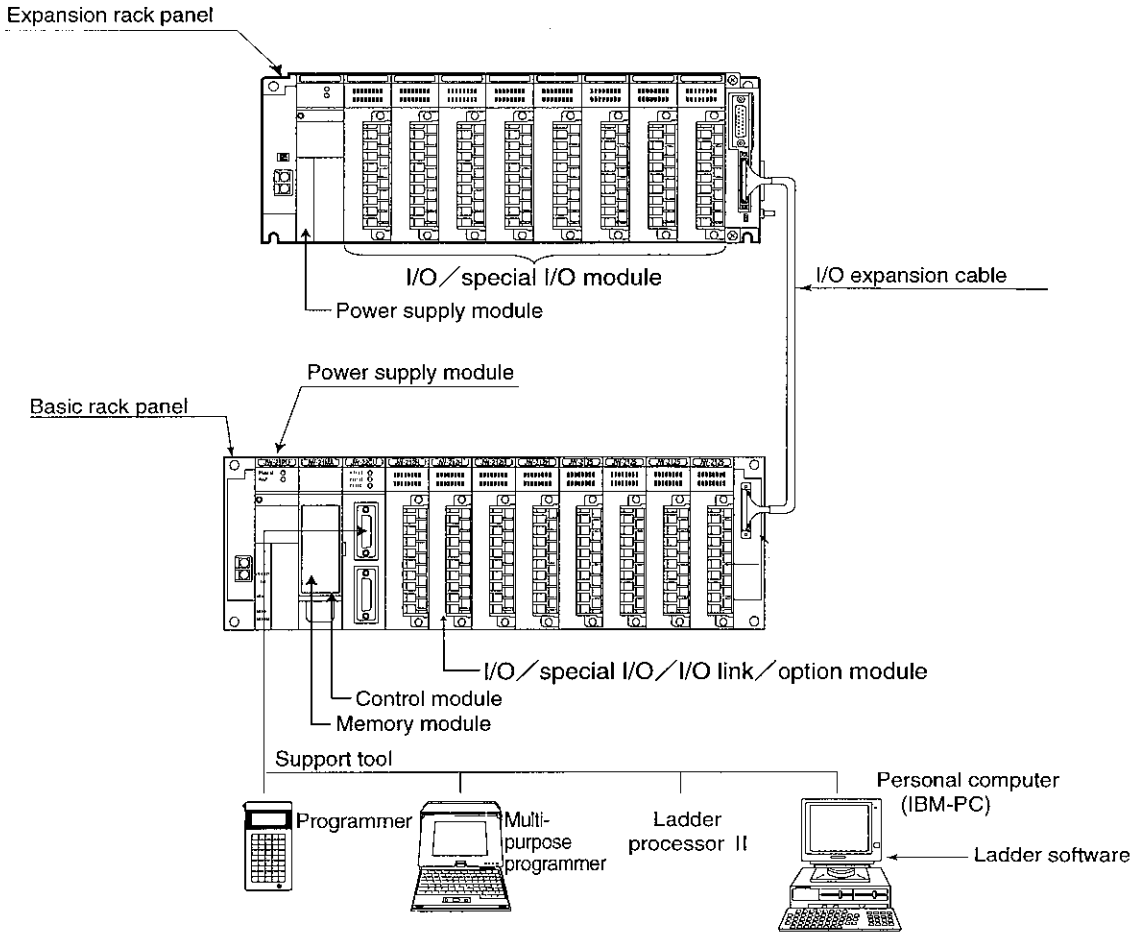


- Connecting an input module and output module for lighting lamps in front of emergency stop circuit makes it possible to grasp the stop condition of devices.
- When the JW20H stops its operation, all the output module indicate ON/OFF condition just before stopping.

  Note: When setting an output holding address in the system memory, all the output after the setting address is retained and you can reset the previously set adress.
  (only available when power is supplied to the JW20H.)
- Halt output (relay output: 100/200 VAC, 30 VDC, 1A)
- Interlock circuit

  Prepare external interlock circuit to prevent reverse operation, damage to machines and injury of workers.

3-3. Basic System Configuration



■ Kinds of control module

Model name	No. of I/O points	Program capacity	Remarks
JW-21CU	128 points	3.5K words max.	
JW-22CU	512 points	7.5K words max.	Clock feature and communication port installed.

■ Kinds of memory module

Model name	Memory device	Program capacity	Battery
JW-21MA	RAM	3.5K words	Attachment
JW-22MA	RAM	7.5K words	
JW-21MO	EPROM+RAM	3.5K words	
JW-21ME	EEPROM+RAM	3.5K words	

■ Kinds of power supply module

Model name	Specifications
JW-21PU	85 to 264 VAC, power capacity : 5VDC 3.5A
JW-22PU	20.4 to 32 VDC, power capacity : 5VDC 3.5A
JW-31PU	85 to 132 VAC, power capacity : 5VDC 3.5A (applied to UL/CSA standard)

■ **Kinds of basic/expansion rack panel**

Model name		No. of slots			Remarks
		For power supply module	For control module	For I/O module	
Basic	JW-24KB	1	1	4	I/O expansion cable, 5VDC cable are optional.
	JW-26KB	1	1	6	
	JW-28KB	1	1	8	
Expansion	JW-24ZB	1	-	4	
	JW-26ZB	1	-	6	
	JW-28ZB	1	-	8	

The slot for I/O module is a slot mounting I/O ／ special I/O ／ I/O link ／ option module.

■ Kinds of I/O ／ special I/O ／ I/O link ／ option modules

	Model name	Specifications
I/O	JW-201N	8 points input, 100/120 VAC
	JW-202N	8 points input, 12/24 VDC
	JW-203N	8 points input, 200/240 VAC
	JW-211N	16 points input, 100/120 VAC
	JW-212N	16 points input, 12/24 VDC
	JW-214N	16 points input, 12/24 VDC (high speed type)
	JW-234N	32 points input, 12/24 VDC (high speed type, connector connection)
	JW-202S	8 points output, 5/12/24 VDC, 1A, transistor output (sink output)
	JW-203S	8 points output, 100/200 VAC, 1A triac output
	JW-204S	8 points output, 250 VAC/30 VDC, 2A relay output (separated common)
	JW-212S	16 points output, 5/12/24 VDC, 0.5A, transistor output (sink output)
	JW-213S	16 points output, 100/200 VAC, 0.5A triac output
	JW-214S	16 points output, 250 VAC/30 VDC, 2A, relay output
	JW-232S	32 points output, 5/12/24 VDC, 0.1A, transistor output (sink output, connector connection)
	JW-232M	16 points input, 12/24 VDC 16 points output, 5/12/24 VDC, 0.1A, transistor output (sink output, connector connection)
Special I/O	JW-264N	64 points input, 24 VDC (high speed type, conector connection)
	JW-262S	64 points output, 5/12/24 VDC, 0.1A, transistor output (sink output, connector connection)
	JW-21HC	High speed counter: 100 kHz 1ch
	JW-22HC	High speed counter: 100 kHz/200 kHz 2ch
	JW-24AD	Analog input: 4 points 13 bits
	JW-22DA	Analog output: 2 points 16 bits
	JW-21DU	ID control: Microwave system
	JW-22DU	ID control: Microwave/light system
	JW-21SU	Serial interface 1ch RS-232C/422A
	JW-21PS	Pulse output, number of control axis: 1. Max speed: 250 kpps.
I/O link	JW-23LM	I/O link master station, up to 32 slave stations, max. 504 points, 172.8 kbits/s
	JW-23LMH	I/O link master station, up to 32 slave stations, max. 504 points, 345.6 kbits/s ／ 172.8kbits/s
Option	JW-21CM	Select from computer link ／ data link ／ remote I/O functions by switching.
	JW-22CM	Net work module
	JW-21MN	ME-NET module
	JW-25CM	JW10 link module
JW-21RS		Remote I/O slave module

■ Kinds of support tools

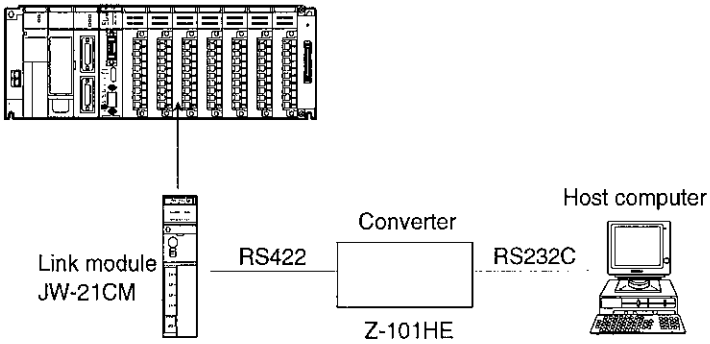
	Model name	Outline	Remarks
Hand-held programmer	JW-11PG/12PG/13PG	LCD dot matrix display	Applied to the all PC.
	JW-2PG		JW20H only.
	JW-10PG		Usable within the functions of the JW50/70/100.
	JW-101PG1		
Multipurpose programmer	JW-40PG	16 gradation EL display (640 × 480 dot) Built-in 1 set of 3.5" floppy disk drive Built-in 1 set of 2.5" hard disk (20MB)	*Usable within the functions of the ZW model.
	JW-50PG	LCD display (640 × 480 dot) Built-in 1 set of 3.5" floppy disk drive Built-in 1 set of 2.5" hard disk (256MB)	Applied to the all PC.
	JW-30PG JW-32PG+JW-33SP(Applied to JW20H)	LCD display : JW-30PG (640 × 400 dot) EL display : JW-32PG (640 × 400 dot) Built-in 2 set of 3.5" floppy disk drive	JW-30PG/32PG (version 1.2 or more) is applied to JW20H.
Ladder processor II	Z-100LP2F + Z-3LP2ES (Expansion module)	EL display Horizontal: 11 relay contacts plus 1 coil Vertical: 11 relay lines plus 2 message lines Built in 1 set of 3.5" floppy disk drive.	Usable within the functions of the JW20H when Z-3LP2ES is installed.
Ladder software	JW-91SP/92SP	Ladder software for PC-98 series, Japanese display	For compatible model of personal computer, see the instruction manual.
	JW-52SP	Ladder software for DOS/V personal computer, Japanese display	
	JW-50SP	Ladder software for IBM-PC	

*ZW model means W10/16/51/100/70H/100H.

3-4. System Configuration using Special/Option Module

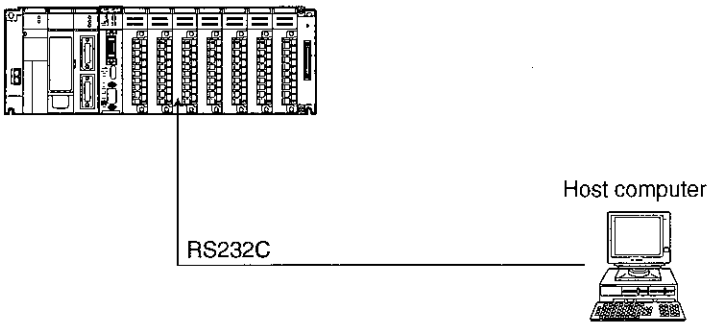
[1] Computer link system

(1) Host computer-linked system using JW-21CM



- This system communicates data between a host computer and the JW20H.
- The JW-21CM can be installed on any slot of the basic rack panel.
- Up to 7 modules of JW-21CM can be installed.
- Communication with conventional W series is available.

(2) Host cnomputer-linked system using a communication port of JW-22CU

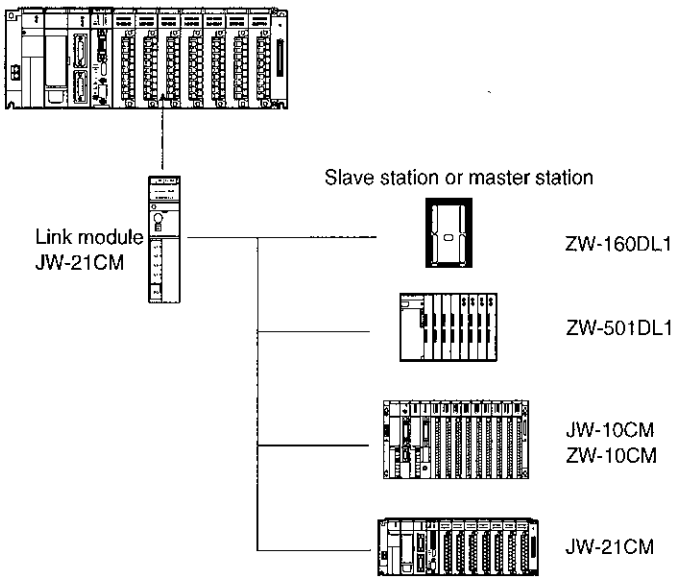


- This system communicates data between a host computer and the JW20H.
- This system communicates host computer without the JW-21CM.

Note: For operational details of communication port, see page 49 "Communication Port (JW-22CU)".

[2] Data link system

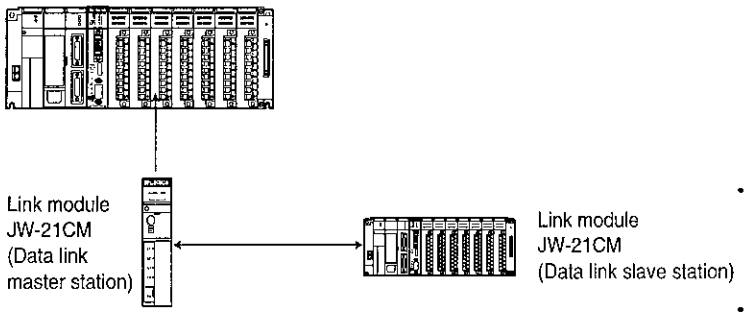
(1) Data link DL1(N:M type) system using JW-21CM



- The system communicates between the JW20H and W series through the JW-21CM as a data link DL1 master station or slave station.
  When JW-21CM is used as master station or slave station of W series, the JW-21CM can be used JW-10CM, ZW-10CM, ZW-501DL1, and ZW-160DL1.
- Data link DL1(N:M type) system can constuct a system having max. 15 stations and 512 points of slave stations.
- When JW-21CM is used as data link, up to 6 modules can be installed only to I/O slot of basic rack panel.

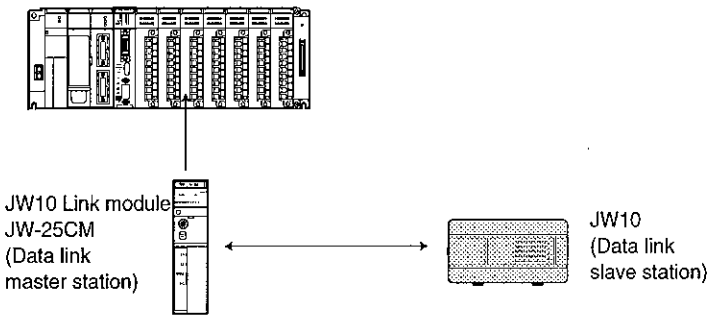
(2) Data link DL9(1:N type) system using JW-21CM

- When JW-21CM is a master station



- The system communicates between the JW20H and W series through the JW-21CM as a data link DL9 slave station.
  When JW-21CM can be used JW-10CM, ZW-10CM, ZW-1KODL9, ZW-501DL9, and ZW-160DL9 as master module.
- Data link DL9(1:N type) system can constuct a system having max. 15 stations and 4096 points of slave stations.
- When JW-21CM is used as data link, up to 6 modules can be installed only to I/O slot of basic rack panel.

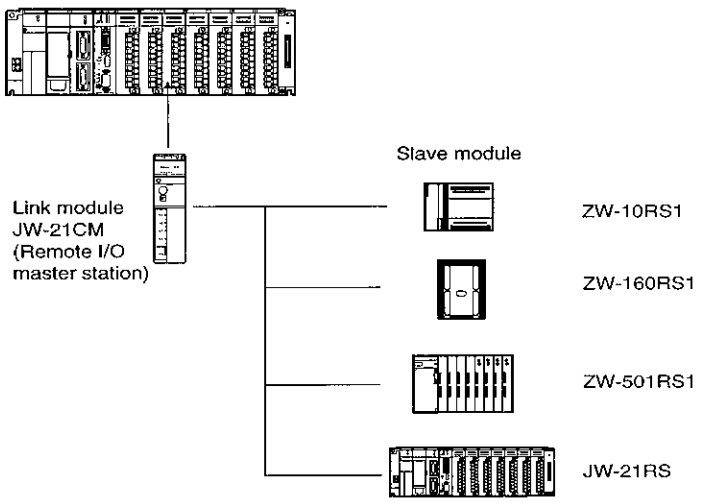
(3) Data link system using JW-25CM



- The system can communicates data of 1 (master station) : N (slave station) type between the JW10 (slave station) and JW-25CM as a master station.
- Slave station is connected at max. 63 stations.
- Mater station data switching exchange between each slave stations and sending 8 bytes , receiving data 8 bytes.
- This communication system can only communicate between a master and a slave station. It cannot communicate between slave stations.

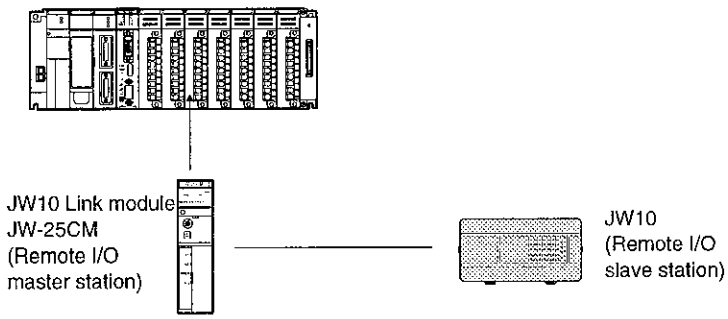
[3] Remote I/O system

(1) Remote I/O system using JW-21CM as a remote I/O master station



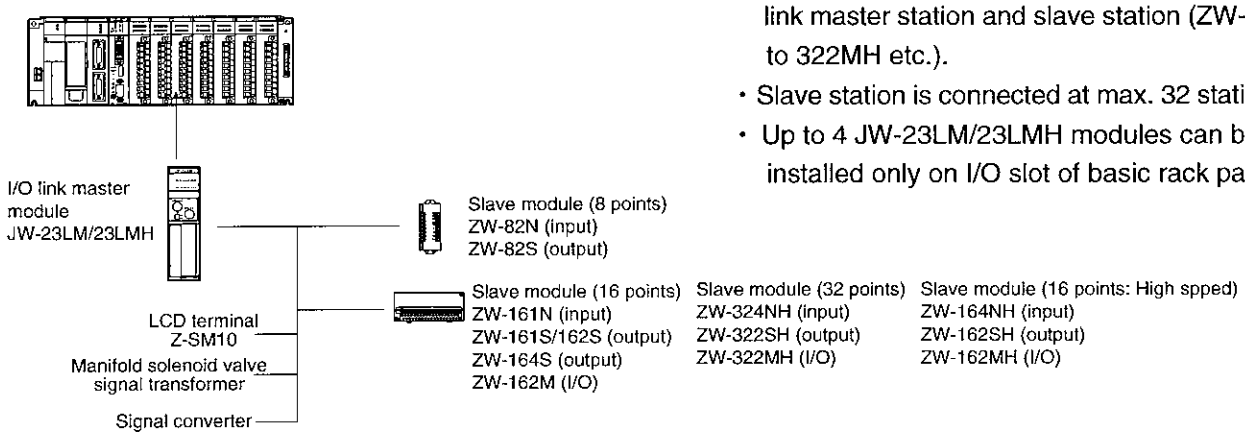
- The system communicates data between the JW20H and remote I/O slave station (JW-21RS, ZW-501RS etc.) of the W series through the JW-21CM as a remote I/O master station.
- When the JW-21CM is used as a master station, max. 4 of slave stations can be connected.
- When JW-21CM is used as remote I/O master station, only 1 module can be installed only to I/O slot of basic rack panel.

(2) Remote I/O system using JW-25CM as a remote I/O master station



- The system can communicate between a JW-25CM as a remote I/O master station and a JW10 (slave station).
- Slave station is connected at max. 63 stations.
- No. of I/O points of slave stations is max. 60 points per stations (input 36 points, output 24 points).

[4] I/O link system



- The system can communicate between a I/O link master station and slave station (ZW-82N to 322MH etc.).
- Slave station is connected at max. 32 stations.
- Up to 4 JW-23LM/23LMH modules can be installed only on I/O slot of basic rack panel.

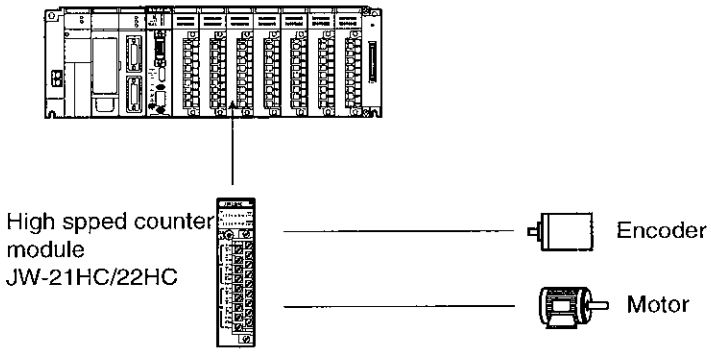
[5] Satellite Net

The system can send and receive ON/OFF signal and numerical data between W/JW series PCs (W70H/100H, JW50/70/100, JW50H/70H/100H, and JW20H) or between personal computers by mounting a JW-22CM on a JW20H.

[6] ME-NET

The system can send and receive ON/OFF signal and numerical data between device having network module supporting the ME-NET specifications by mounting a JW-21MN to a JW20H.

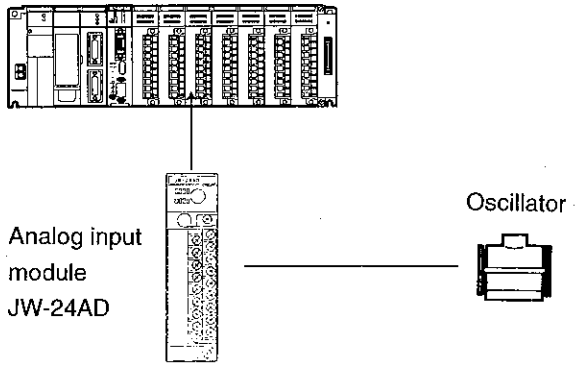
[7] High speed counter system



- High-speed counter module: JW-21HC/22HC transfer calculating data to data memory of the JW20H. For high-speed counter, JW-21HC is built in 1 channel and JW-22HC is built in 2 channels.
- The JW-21HC/22HC can be installed in any position of I/O slot of basic/expansion rack panel.

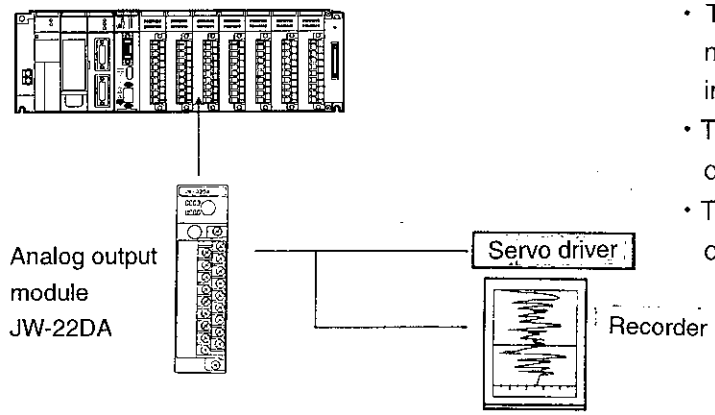
[8] System using analog input/analog output module

(1) System using analog input module



- The analog input module : JW-24AD is a module to input analog signal to the JW20H.
- The JW-24AD can connect 4 points of analog input.
- The JW-24AD can be installed in any position of I/O slot in basic/expansion rack panel.

(2) System using analog output module



- The analog output module : JW-22DA is a module to output analog signal to a recorder, inverter, etc.
- The JW-22DA can connect 2 points of analog output.
- The JW-22DA can be installed in any position of I/O slot in basic/expansion rack panel.

[9] System using serial interface module

The system can communicate with external device having RS-232C/422 interface such as host computer or satellite monitor by mounting a JW-21SU on a JW20H.

[10] ID plate system (microwave/optical)

The system can send and receive in ID plate and data by mounting a JW-21DU/22DU on a JW20H. Sending or receiving data is communicated by microwave or infrared rays.
When JW-21DU/22DU is used by JW20H, be sure to use that scan time is 4 ms or longer.
When scan time is 4 ms or shorter, add the ladder program.

3-5. Specifications

[1] General specifications

Items	Specifications		
	JW-21PU	JW-22PU	JW-31PU
Power voltage	85 to 264 VAC, 47 to 63Hz	20.4 to 32.0 VDC*	85 to 132 VAC, 47 to 63Hz
Guaranteed voltage interruption time	Available voltage interruption time of 10 ms max.		
Insulation resistance	10 M ohm min. at 500 VDC megger		
	(between AC external terminal and rack panel)	(between DC external terminal and rack panel)	(between AC external terminal and rack panel)
Dielectrical strength	1500 VAC, 50/60 Hz for 1 minute (between AC external terminal and rack panel)	1000 VAC, 50/60Hz for 1 minute (between DC external terminal and rack panel)	1500 VAC, 50/60Hz for 1 minite (between AC external terminal and rack panel)
Noise immunity	1000 Vp-p 1 μs width impulse (by noise simulator between the power line and rack panel)		
Storage temperature	–20 to 70°C		
Ambient temperature	0 to 55°C		
Ambient humidity	35 to 90% RH (non-condensing)		
Atmosphere	Free from corrosive gas		
Vibration resistance	JIS C 0911 or equivalent (2 hours in each of X, Y and Z axis)		
Shock resistance	JIS C 0912 or equivalent (10G, 3 times in each X, Y and Z axis)		
Power consumption	30 W (60VA) max. (at max load state of single power supply module)		
Weight	Approx. 3.6 kg (When one power supply module, one control module, one memory module, and eight I/O modules installed in basic rack panel)		
Grounding	Class-3 grounding		

* As for DC input power source, use power source of 20.4 to 32 VDC (ripple rate 20% or less; however, ripple upper limit: 32 V or less, lower limit: 20.4 V or more).

[2] Performance specifications

Items		Specifications	
		JW-21CU	JW-22CU
Program system		Stored program system	
Control system		Compatible cyclic calculation and interrupt dealing system	
Processing speed		Basic instruction (except OUT, TMR, CNT, MD) : 0.54 μs/instruction OUT instruction : 0.72 μs/instruction Application instructions, TMR, CNT, MD instructions : average number μ to several tens μs/instruction	
Type and numbers of instruction		Basic instruction : 20 Application instruction : 113	
Program size	RAM	3.5K words (using the 21MA, 22MA)	3.5K words for 21MA, 7.5K words for 22MA
	EPROM	3.5K words (using the 21MO)	3.5K words (using the 21MO)
	EEPROM	3.5K words (using the 21ME)	3.5K words (using the 21ME)
Memory back-up		By built-in lithium battery. When using JW-21ME/21MO, available for battery less operation.(necessary while using clock feature)	
I/O control system		Both block refresh system and refresh system by instruction are applied.	
Max. numbers of I/O points		128 points (max. no. of racks : 4)	512 points (max. no. of racks : 4)
		8 points module and vacant slot are occupied 16 points.	
Data memory	I/O Relay	512 points (00000 to 00777) [□0000 to □0077] *1	
	I/O link module	512 points (01000 to 17777) [□0100 to □1777] *3	
	Special I/O module	1024 points (02000 to 0377) [□0200 to □0377] *3	
	Auxiliary relay	1536 points (04000 to 06777) [□0400 to □0677]	
	Latched relay	224 points (07000 to 07337) [□0700 to □0733] 256 points (07400 to 07777) [□0740 to □0777] *2	
	Option module relay	2056 points(10000 to 14777) [□1000 to □1477] *3	
	Option module flag	512 points(15000 to 15777) [□1500 to □1577] *3	
	Special relay	32 points(07340 to 07377) 07340 to 07347 : Error code strage 07354 : Non-carry flag 07355 : Error flag 07356 : Carry flag 07357 : Zero flag 07360 : 0.1 second clock 07362 : Initialize pulse 07363 : Fuse blown 07364 : 1.0 second clock 07365 : Setting value change switch 07366 : Normally OFF contact 07370 : Memory error 07371: CPU error 07372 : Battery error 07373 : I/O error 07374 : Option error 07375 : Special I/O module error flag 07376 : Expansion power supply error 07377 : Power supply error	

Items		Specifications	
		JW-21CU	JW-22CU
Data memory	Timer/counter/MD	Total 512 points [000 to 777] • Timer set time 100 ms timer (TMR000 to 777) 0.1 sec. to 199.9 sec. 0.1 sec. to 3276.7 sec.(BIN) 0.1 sec. to 799.9 sec.(BCD) 10 ms timer (TMR 700 to 777) 0.01 sec. to 19.99 sec.(BCD) • Counter setting value 1 to 1999 1 to 32767 (BIN) 1 to 7999 (BCD) • MD setting value 0 to 999 The current value of the counter and MD are kept ON at power OFF. Timer is selectable between kept or reset after power OFF. TMR 700 to 777 is selectable timer feature unit between 100 ms and 10ms.	
	Register	4096 bytes (kept after power OFF) 09000 to 09777, 19000 to 19777, 29000 to 29777, 39000 to 39777, 49000 to 49777, 59000 to 59777, 69000 to 69777, 79000 to 79777	
	Register for option module	512 bytes 89000 to 89777	
	Special register	512 bytes 99000 to 99777	
	Special register (for error code storage)	1 byte 00734	
	Timer current value storage register	——	Second : 99770 Minute : 99771 Hour : 99772 Day : 99773 Month : 99774 Year : 99775 The day of the week : 99776 Control code : 99777

Items	Specifications	
	JW-21CU	JW-22CU
Data memory		
Error history storage register	This register can store the last 8 error codes of the Control Module including the error occurrence time and the number. Total 1k bytes (E0000-E1777)	

E0000 to E0177	Module No. Switch 6	Error 8
E0200 to E0377	Module No. Switch 5	Error 7
E0400 to E0577	Module No. Switch 4	Error 6
E0600 to E0777	Module No. Switch 3	Error 5
E1000 to E1177	Module No. Switch 2	Error 4
E1200 to E1377	Module No. Switch 1	Error 3
E1400 to E1577	Module No. Switch 0	Error 2
E1600 to E1777	Control Module	Error 1

00	Second
01	Minute
02	Hour
03	Date
04	Month
05	Year
06	Day of week
07	Error code
10	Error rack·slot·switch
11	No. of error
12	Reserved
13	Reserved
14	Reserved
15	Reserved
16	Reserved
17	Reserved

The error occurrence time is stored by 24 hour indication.

Items	Specifications	
	JW-21CU	JW-22CU
System memory	256 bytes	

Address	Function
#030	Monitor the minimum scanning time (lower digit BCD)
#031	Ditto (upper digit BCD)
#032	Monitor the current scanning time (lower digit BCD)
#033	Ditto (upper digit BCD)
#034	Monitor the maximum scanning time (lower digit BCD)
#035	Ditto (upper digit BCD)
#046	Monitor the error detected I/O rack panel and slot No. (OCT)
#050	Monitor the error switch No.
#052	Monitor the error address on user's program (lower digit OCT)
#053	Ditto (upper digit OCT)
#160 to 167	Store the error code of self-diagnosis
#170 to 177	Store the error code on option module
#201	Set the resetting conditions of TMR
#202	Set the resetting conditions of CNT
#227	Selecting the 10 ms timer function
#230	Set latched relay area of expansion relay area. (lower digit OCT)
#231	Ditto (upper digit OCT)
#232	Set output hold address of expansion relay area. (lower digit OCT)
#233	Ditto (upper digit OCT)
#236 #237	Set mode of a communication port
#240 to 242	Set interrupted input
#255	Set no-battery operation

Items		Specifications	
		JW-21CU	JW-22CU
Data memory	Parameter (Registerable to ROM)	Parameter for special module : 128 bytes × 32 modules Parameter for option module : 64 bytes × 7 modules	
	Symbol memory (Registerable to ROM)	768 symbols max. (6K bytes)	1024 symbols max. (6K bytes)
		6 alpha numeric or kana characters per symbol. Registerable to step no. for relay, coil, register, and SF instruction. Standard for memory module	
Interrupt program*4		Input interruption : 8 points (LB1360 to LB1367) Timer interruption : 10, 20, 50,100 ms in each (LB1354 to LB 1357)	
Communication port		None	Communication standard : RS-232C/RS-422A Transfer speed : 19200/9600/4800/2400/1200 bits/s Data length : 7 bits Parity bit : Odd/even/none Stop bit : 1/2 bit Connection form : 1:1 (RS-232C) 1: N (RS-422A) Communication format : Computer link or equipment Connector : 15 pin D-sub No. of connected stations : 10 sets max.
Debugging function	Sampling trace	Data can be traced for (relay 16 points + register 6 bytes) × 256 times, or relay 16 points × 1024 times at an arbitrate period. (10 ms unit)	
	Break function	Available setting any program address as a break point.	
	Step operation	Can execute program in one circuit unit.	
	N scan operation	Execute operation each time the specified number of scans (1 to 99).	
	Available forced ON/OFF of I/O relay	Available switch ON/OFF for I/O relay regardless of the input signal or operation result.	
Weight		Approx. 250g	Approx. 260g
Accessories		One instruction manual	

Note 1: Number of I/O relay occupied points varies from each I/O module. (see page 48.)

Note 2: By setting system memory #230 and #231, latched relay area function (saving the conditions just before power failure) can be expanded or reduced by 8 points unit.

Note 3: In data memory, each relay (partly including register) of the I/O link, special I/O, option module, and the option module flag can be set as follows by the module No. switch of the special / option module.

Data memory area	Module name	Model name	Module No. switch	Setting top address		Remarks
				Top byte address	Flag area	
I/O link	I/O link master station	JW-23LM JW-23LMH	SW0	□0100	□1570	Max. No. of modules : 4
			SW1	□0120	□1572	
			SW2	□0140	□1574	
			SW3	□0160	□1576	
Special I/O relay	Analog input	JW-24AD	SW0	□0200	-	Each module have 128 bytes for parameter Max. No. of modules : 8
			SW1	□0220	-	
	Analog output	JW-22DA	SW2	□0240	-	
	High-speed counter	JW-21HC /22HC	SW3	□0260	-	
			SW4	□0300	-	
	Sereal interface	JW-21SU	SW5	□0320	-	
			SW6	□0340	-	
	ID control	JW-21DU /22DU	SW7	□0360	-	
Option module relay	Link module	JW-21CM	SW0	□1000	□1500	Each module have 64 bytes for parameter Max. No. of modules : 7
			SW1	□1100	□1510	
			SW2	□1200	□1520	
			SW3	□1300	□1530	
			SW4	□1400	□1540	
			SW5	89000	□1550	
			SW6	-	□1560	

Note 4: There are two types of interruption program, one is input interruption and the other is timer interruption. Both types can be set independently of interruption permission/prohibition. If interruption prohibition is set, you can use the interruption label as the conventional label.

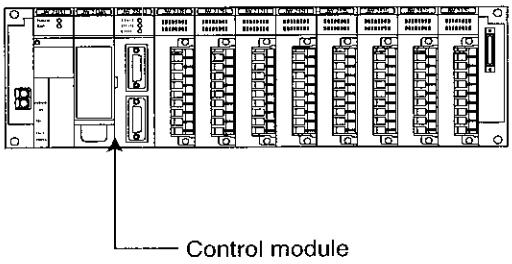
Chapter 4. Name and Function of Each Part

4-1. Control module (JW-21CU/22CU)

Two types of control modules are available for the JW20H.
Their features are as follows. Understand their the difference between them well and how to use them properly.

Model name	Available memory	Memory size	No. of I/O points	Communication port	Clock function
JW-21CU	JW-21MA JW-22MA JW-21MO JW-21ME	3.5K words	128 points	×	×
JW-22CU	JW-21MA JW-22MA JW-21MO JW-21ME	3.5K words 7.5K words 3.5K words	512 points	○	○

Note 1: When the JW-22MA is in use as the memory module in the JW-22CU, its program size become 3.5K words. When the program capacity of the JW-22CU is within 3.5K words, the JW-21MA/ JW-21MO/JW-21ME are usable as the memory module. However, when the program size exceeds 3.5K words, only the JW-22MA is applicable as a memory module.

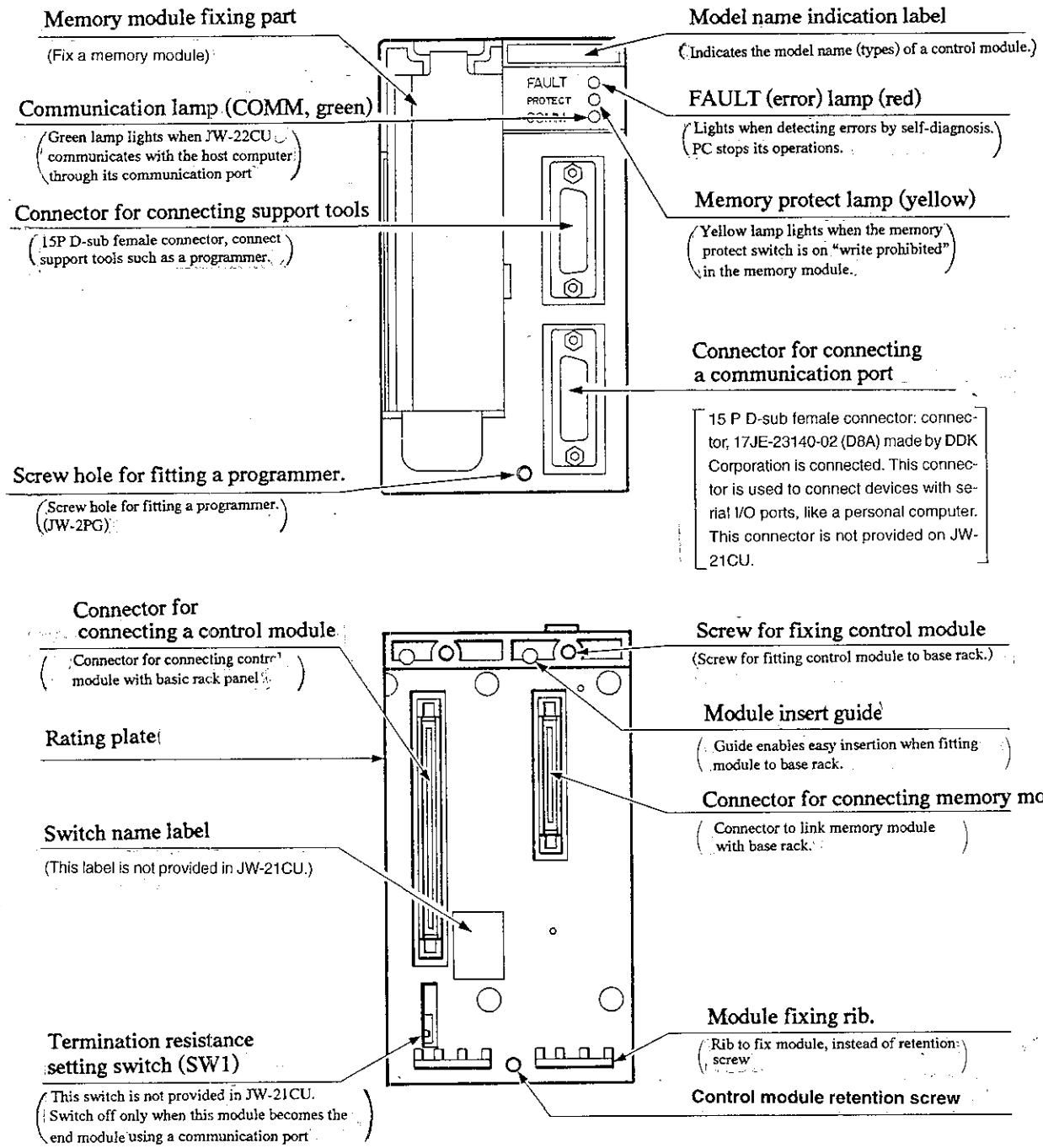


Note 2: The weight of the control module is as follows :

Model name	Weight
JW-21CU	Approx. 250g
JW-22CU	Approx. 260g

[1] Name of each part and its function

The name of each part and its function are shown taking the JW-22CU as an example.

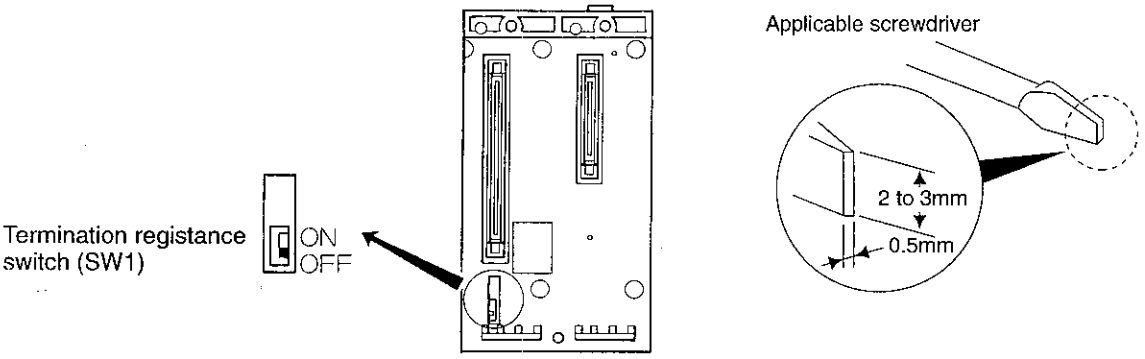


Note1 Connectors connecting a support tool and a communication port have been covered with a connector cover at the factory. Keep them covered in case of no application of a support tool and a communication port. The connector cover is easily removed by inserting a slot screwdriver to the cut part of the upper part of the cover and twisting the slot screwdriver softly. On fitting, be aware of its direction. It cannot fit in up side down. Above figure is shown without connector covers.

[2] Setting the termination resistance swicth (SW1) (for communcation port : JW-22CU only)

The termination resistance should only be swicthed at the end control module to communicate with a host computer through a communcation port. The termination resistance is switched OFF in case of the RS-232C and ON in case of the RS-422. If you make a mistake, you can't communicate.

• Position of the termination resistance



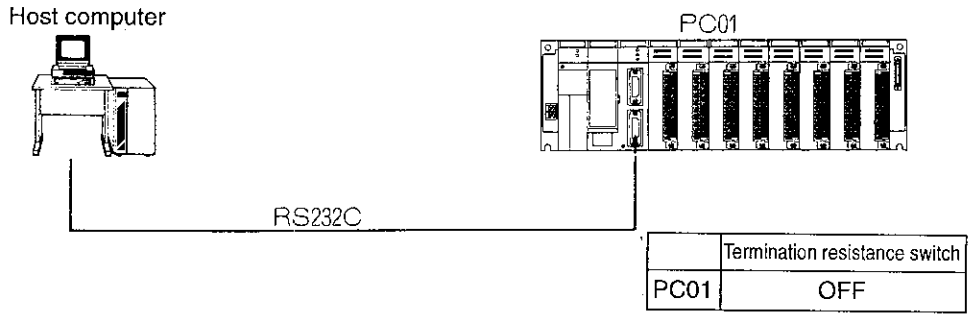
The termination resistance switch is located on the rear panel of the control module as above. In case of setting, use a slot screwdriver with small tip.

Switch name	Setting	Condition of control module
Termination resistance swicth	ON	Set the termination resistance
	OFF	Not setting the termination resistance

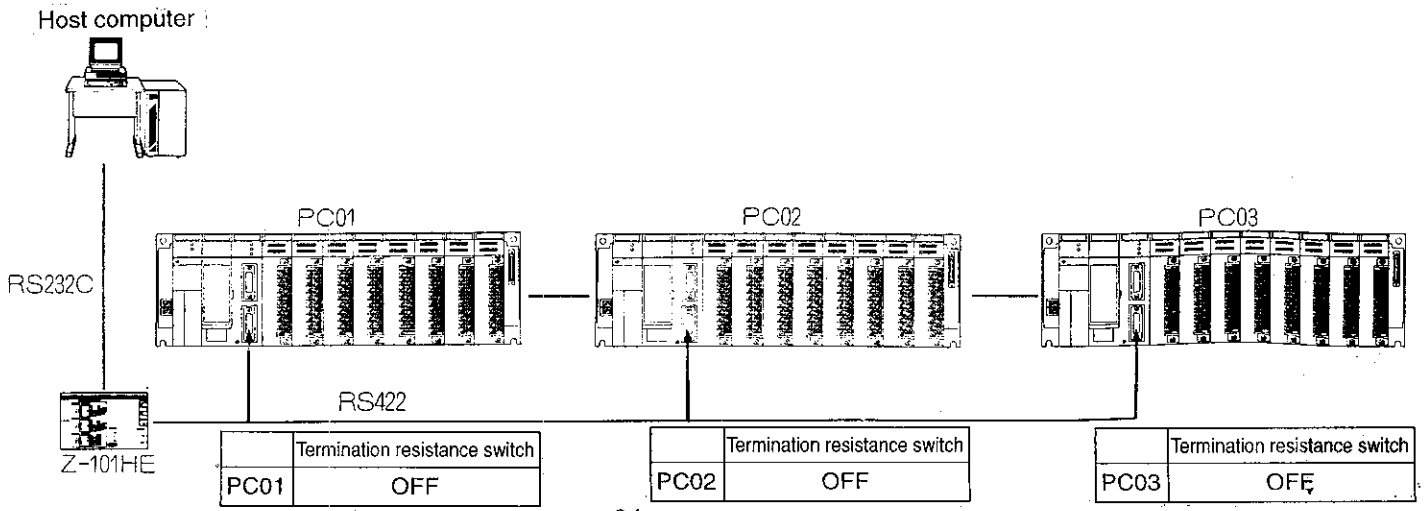
The termination resistance switch is switched OFF at the factory.

Reference : Insert the termination resistance switch as follows, as it has the following functions.

1. It decreases a generated alternative induced voltage when the impedance of a receiver is higher than that of a sender.
2. It prevents occurrence of the reflected wave at communication.



	Termination resistance switch
PC01	OFF



	Termination resistance switch
PC01	OFF

	Termination resistance switch
PC02	OFF

	Termination resistance switch
PC03	OFF

4-2. Memory module (JW-21MA/22MA/21MO/21ME)

Four models of memory modules, JW-21MA, JW-22MA, JW-21MO and JW-21ME are available for the JW20H. Select an appropriate memory module, considering its user's program and symbol size. Difference between each of the modules are shown as follows for easier selection :

■ Kinds of memory module

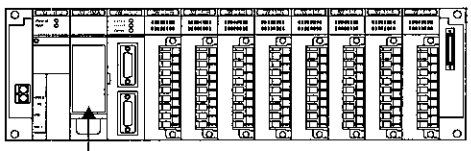
Model name	Memory device	Program size	No. of symbol registration	Memory protect switch	Battery	Weight
JW-21MA	RAM	3.5K words	768 max.	○	Attachment	Approx. 120g
JW-22MA	RAM	7.5K words	1024 max.	○		
JW-21MO	EPROM+RAM	3.5K words	768 max.	○		
JW-21ME	EEPROM+RAM	3.5K words	768 max.	○		

Note 1: When the memory module JW-22MA is connected with the control module JW-21CU, the memory capacity becomes 3.5K words and the symbol registration becomes 768 max.

■ The difference between memory modules

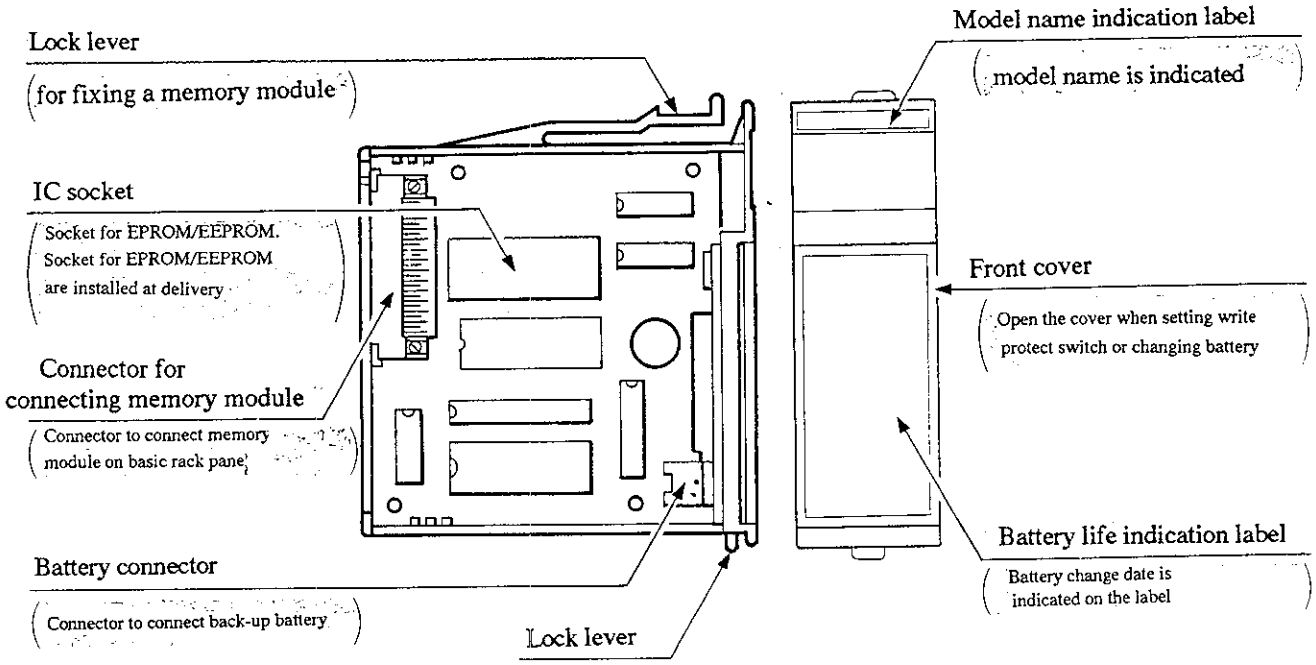
JW-21MA JW-22MA	All memory of program memory, symbol memory and the like is composed of RAM (backup by battery) only.
JW-21MO	Program memory , symbol area, parameter memory is composed of RAM (backup by battery) and EPROM. Available to ROM by PROM programmer. Battery-less operation is available.
JW-21ME	Program memory , symbol area, parameter memory is composed of RAM (backup by battery) and EEPROM. Available to ROM by support tools. Battery-less operation is available.

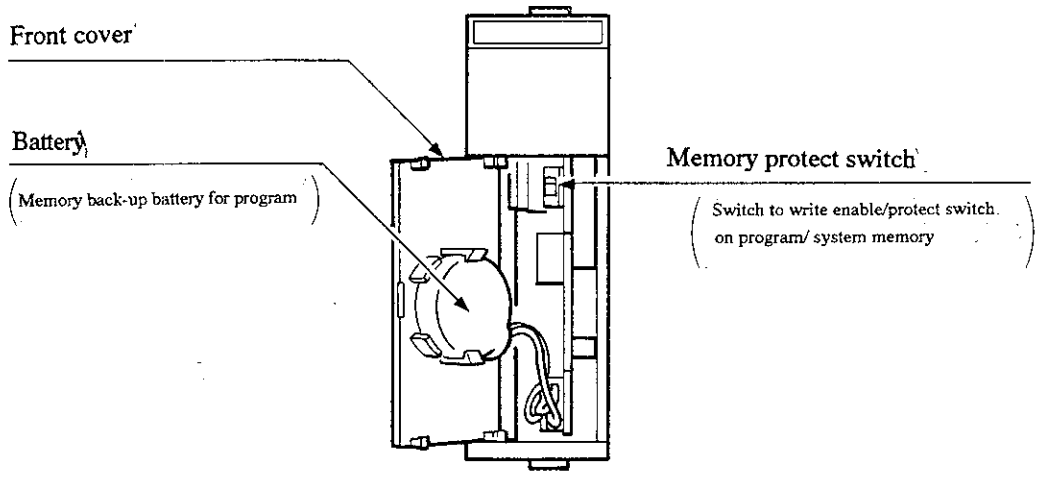
Note 2: EEPROM's capacity for wiring and erasing is limited. Do not write and revise program more than 200 times.



Memory module
(JW-21MA/22MA/21MO/21ME)

[1] Name of each part and its function

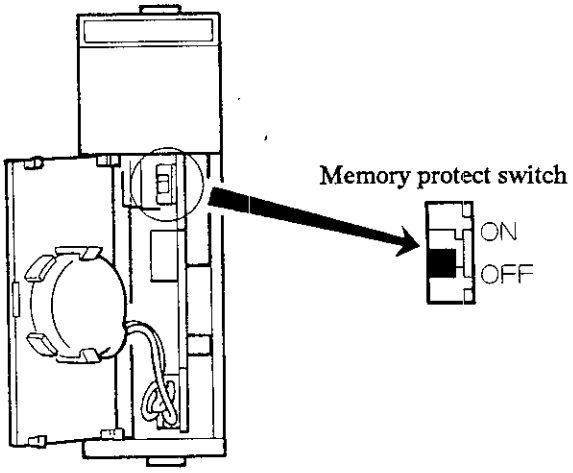




Note 1 No IC socket in the JW-21MA and JW-22MA. EPROM on JW-21MO, EEPROM on JW-21ME are installed, respectively.

[2] Memory protect switch

Memory protect switch is to set write enable/protect on program memory and system memory.



ON		Write protect on program system memory
OFF		Write enable on program system memory

Setting ON of write protect switch, protect memory of the JW20H as follows:

O: write enable, X: write protect

Switch setting	State of programmer	Write on program memory	Write in system memory	Write in EEPROM	Control Module memory protect lamp
ON	Program Change Monitor	X	X	X	Light
	Program	O	O	O	Light off
	Change	X	X	X	
	Monitor	X	X	X	

Note 1 EEPROM installed memory module is the JW-21ME.

Note 2 Loading program and system memory are available regardless of the memory protect switch setting.

Note 3 Setting of memory protect switch is "OFF" on no-battery operation run by ROM. When data transfer from ROM to RAM is not required at power on, set the memory protect switch to "ON."

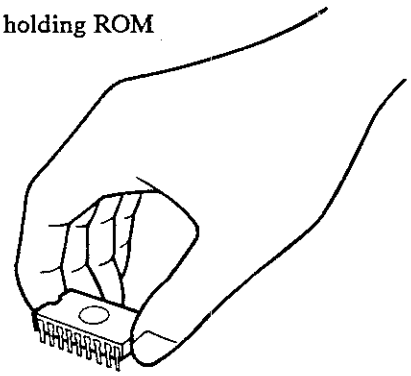
[3] Installing EPROM

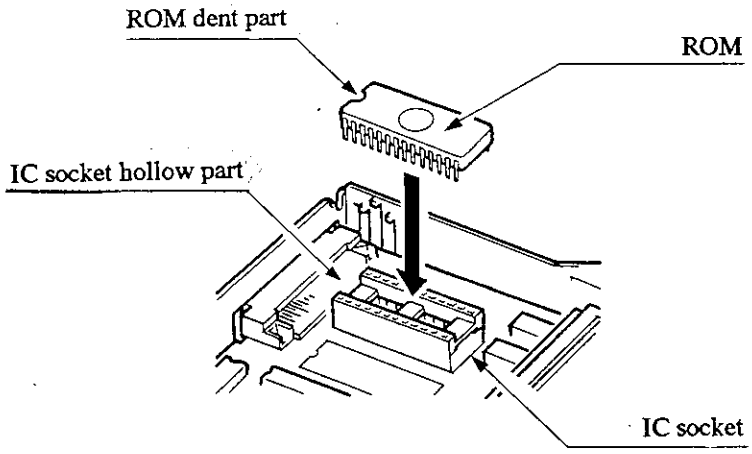
To write program in an EPROM installed on the Memory Module JW-21MO, use a conventional PROM writer. To write program on EPROM, see page 104,"Writing of ROM."

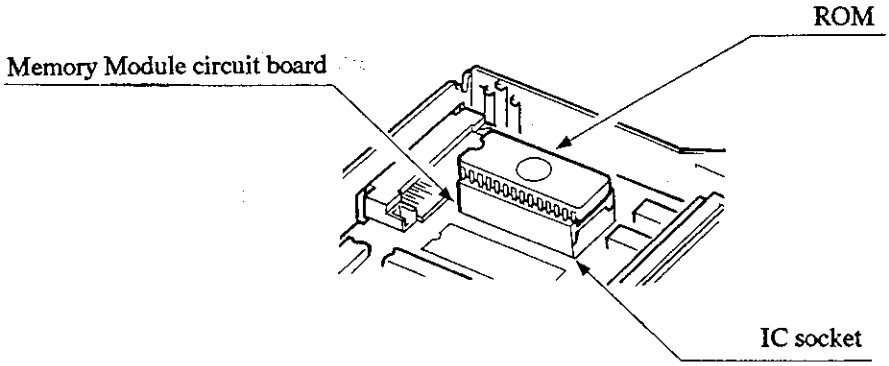
Be careful concerning the following points when installing program written EPROM to the Memory Module JW-21MO:

- Install the IC socket so that the IC socket dent part of a memory and the dent part of the EPROM match.
- After installation, check that pins are installed in the IC socket properly.

How to holding ROM







[4] Installing the Memory Module to the Control Module

Install the Memory Module to the Control Module according to the following procedures:

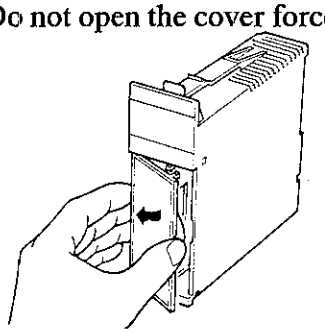
Prior to installation, switch off supply power to the JW20H.Otherwise, the Memory Module may break.

(1) Switch off the power supply to JW20H.

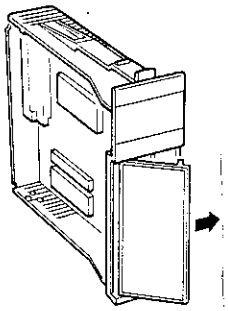
↓

(2) Open front cover.

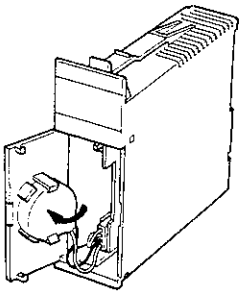
• Do not open the cover forcedly. Otherwise, the cover may break.



(3) Slide cover to the right.

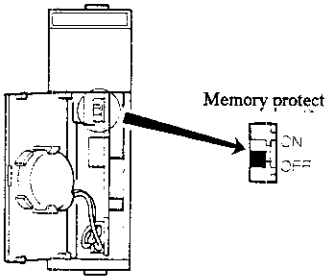


(4) Pull front cover forward to open it.



(5) Set memory protect switch

• After setting, close the cover.

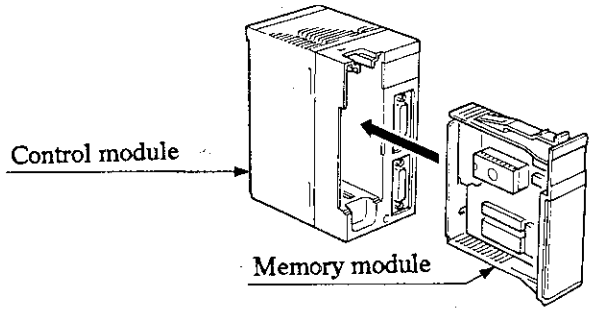


ON		Write protect on program system memory
OFF		Write enable on program system memory

To next page

From previous page

(6) Insert Memory Module on Control Module.

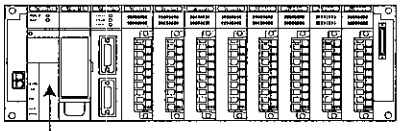


(7) Insert Memory Module until you hear "click" sound.

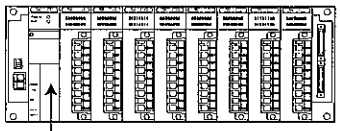
- "Click" sounds when it is inserted properly, and the Memory Module surface and the controller surface match their level. When there is no click or they are not in same level, start inserting from the beginning.

Note : When memory module with battery is removed from control module, clock feature (JW-22CU only) is not operated. In case of using the clock feature, within 1 minute from removing the memory module to installing the module.

4-3. Power supply module (JW-21PU/22PU/33PU)



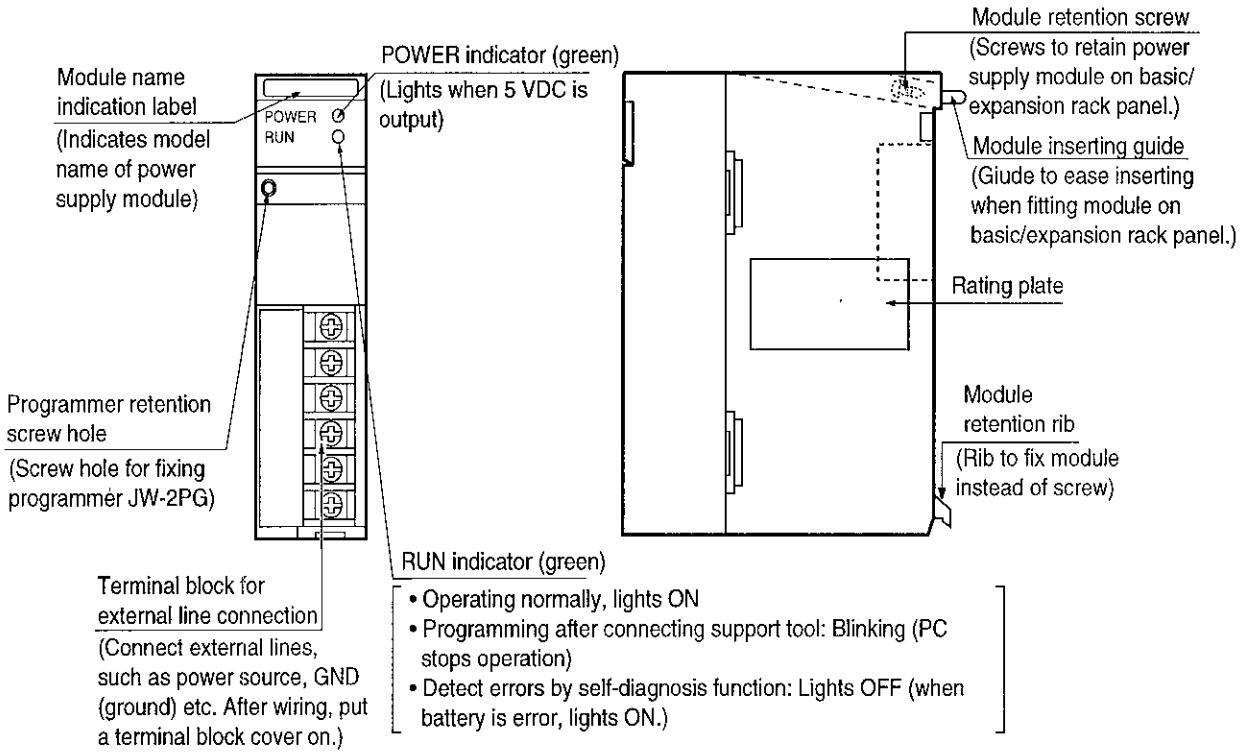
Power supply module : JW-21PU/22PU/31PU



Power supply module : JW-21PU/22PU/31PU

[1] Name and function of each part

In this section, the JW-21PU is shown to explain each part.



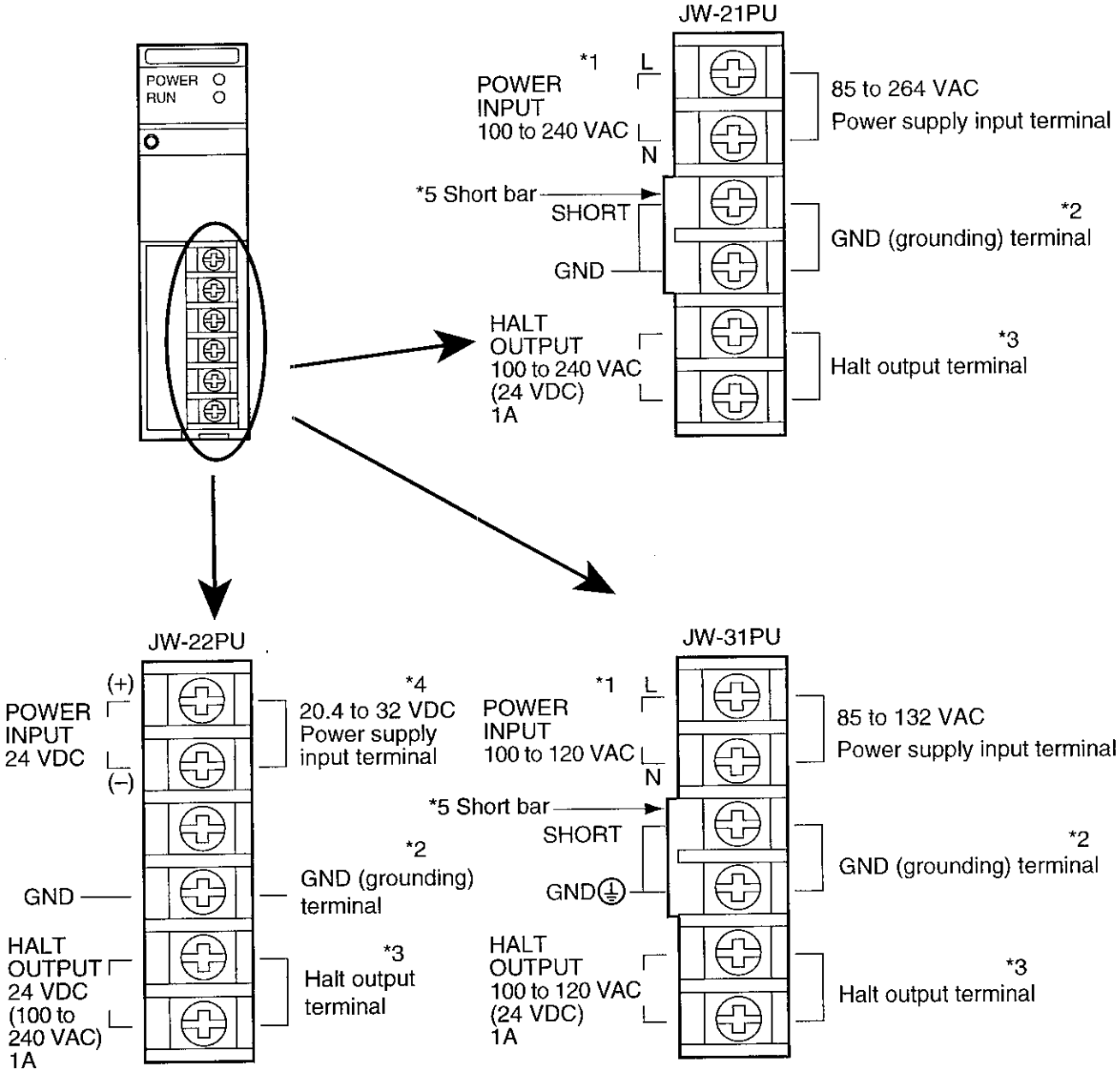
Note 1: In the case the power supply module is connected to the expansion rack panel, when only the power supply module of the basic rack panel is turned ON without supplying the power source, an expansion power source error (#160 = error code 43) results in. Therefore, supply power also to the expansion power supply module.

Note 2: A terminal block cover is fixed on a power source terminal block at delivery. Prior to wiring, remove the cover. After wiring, again be sure to fix the cover. Above instruction explained removing the cover.

Note 3: When JW20H uses in program mode, RUN indicator of the power supply module is blinks higher than JW20. (Approx. 3 times)

■ Terminal block for connecting external lines

This is a terminal block for connecting extended line of power supply, GND, halt output and the like. For details concerning external lines, see page 80 "Power supply module : JW-21PU/31PU" and page 82 "Power supply module : JW-22PU".



*1 Connect the power supply input of JW-21PU/31PU while paying attention to the L terminal (LIVE: non-grounded side) and N terminal (NEUTRAL: grounded side).

*2 To prevent electric shock and noise error, be sure to separately prepare class-3 grounding.

*3 Be sure to incorporate the line to the external emergency stop circuit.

*4 As for DC input power supply, use power source of 20.4 to 32 VDC (ripple rate 20% or less; however, ripple upper limit: 32 V or less, lower limit: 20.4 V or more).

*5 When testing insulation resistance or dielectric strength of the JW-21PU/31PU power supply modules, be sure to remove the short bar connecting between the SHORT terminal and the GND terminal. The power supply module has a serge absorber connected between the AC input line and the SHORT terminal, as well as a short bar between the SHORT terminal and the GND

[2] Specifications

Items	Specifications		
	JW-21PU	JW-22PU	JW-31PU (Approved UL/CSA)
Installed position	Slot for the power supply module of basic/expansion rack panel		
Input voltage	85 to 264 VAC (47 to 63Hz)	* 20.4 to 32 VDC	85 to 132 VAC (47 to 63Hz)
Power consumption	30W (60 VA) or less	30W or less	30W (60 VA) or less (At output current 3.5A)
Surge current	40A or less (200 VAC)	40A or less (32 VAC)	20A or less
Leakage current	1mA or less (at 100 VAC) 3.5mA or less (at 200 VAC)	———	1mA or less (at 100 VAC)
Output voltage	5 VDC		
Output current	3.5A		
Rated output current	0 to 3.5A		
Output hold time	10 ms or more		
Protection circuit	Overcurrent protection	Drooping automatic reset system	
	Overvoltage protection	Shut-off type manual reset system	
Halt output	Function	Relay output becoming OFF when the control module stops.	
	Load voltage	100/200 VAC (50/60Hz) 30 VDC	100 VAC (50/60Hz) 30 VDC
	Load current	1A max.	
	Leakage current	1mA (200 VAC)	1mA or less (100 VAC)
Insuration resistance	500 VDC 10M ohm or less		
Dielectrical strength	1500 VAC for 1 minute	1000 VAC for 1 minute	1500 VAC for 1 minute
Indication	POWER LED (green) RUN LED (green)		
External wire connection system	6P terminal block		
Operation ambient temperature	0 to 55°C		
Storage temperature	–20 to 70°C		
Operation ambient humidity	35 to 90 %RH (without dew condensation)		
Operation atmosphere	Free from corrosive gas		
Vibration resistance	JIS C 0911 or equivalent (2 hours in each of X, Y and Z axis)		
Shock resistance	JIS C 0912 or equivalent (10G, 3 times in each X, Y and Z axis)		
Noise immunity	1000 Vp-p 1μs (by noise simulator between the power line and rack panel)		
Weight	Approx. 330g	Approx. 300g	Approx. 330g

* As for DC input power source, use power source of 20.4 to 32 VDC (ripple rate 20% or less; however, ripple upper limit: 32 V or less, lower limit : 20.4 V or more).

4-4. Basic/expansion rack panel (JW-24KB/26KB/28KB/24ZB/26ZB/28ZB)

Two types of rack panel are available. One is the basic rack panel, the other one is the expansion rack panel. Each rack panel comes in three models.

■ Basic rack panel

The basic rack panel can install the power supply module, control module , and I/O module. The basic rack panel has three models according to numbers of slot of the I/O module.

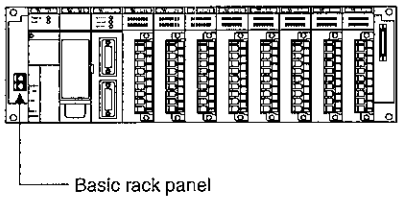
Model name	Number of slots			Weight
	For power supply module	For control module	For I/O module	
JW-24KB	1	1	4	Approx. 720g
JW-26KB	1	1	6	Approx. 870g
JW-28KB	1	1	8	Approx. 1kg

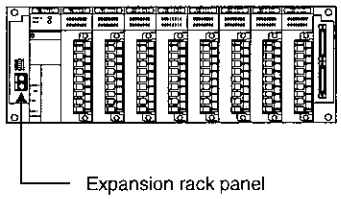
■ Expansion rack panel

The expansion rack panel can install the power supply module and I/O module. The expansion rack panel has three models according to numbers of slot of the I/O module.

Model name	Number of slots			Weight
	For power supply module	For control module	For I/O module	
JW-24ZB	1	1	4	Approx. 540g
JW-26ZB	1	1	6	Approx. 720g
JW-28ZB	1	1	8	Approx. 870g

Note 1: The option module can not be installed on the expansion rack panel.

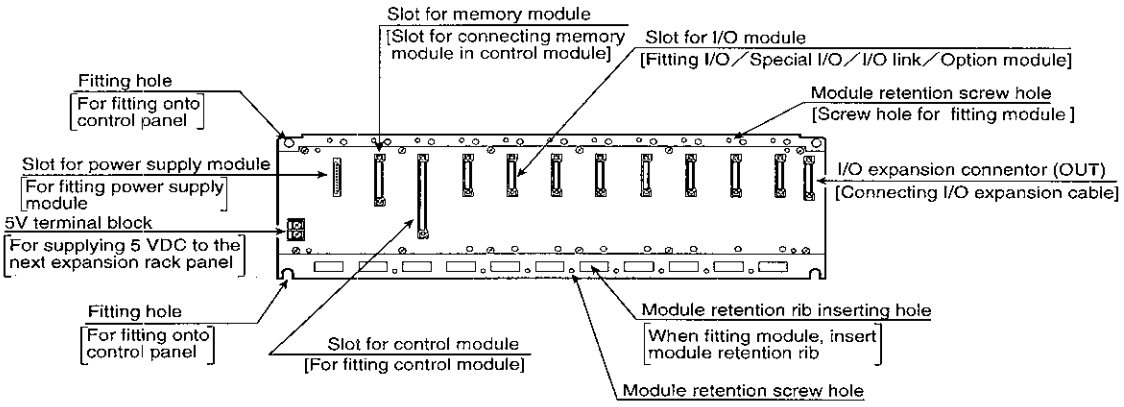




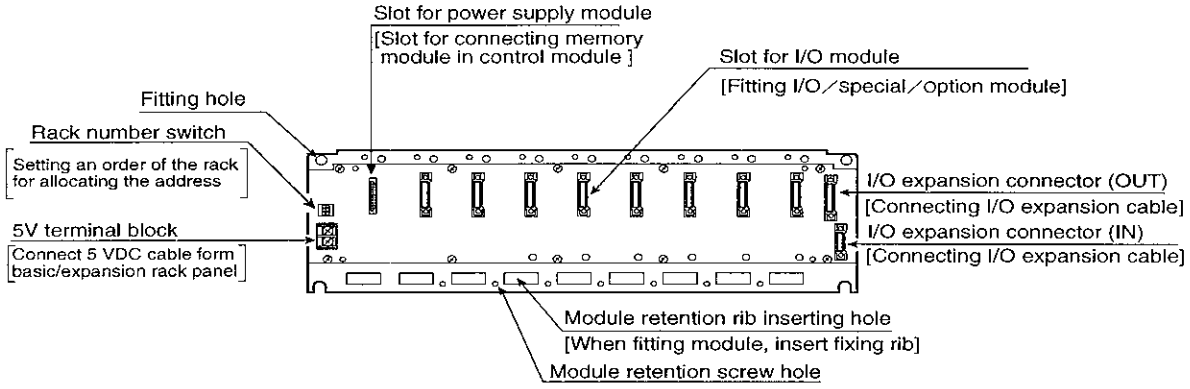
[1] Name and function of each part

The name of each part and its function are shown below taking the basic rack panel : JW-28KB and expansion rack panel JW-28ZB.

Basic rack panel: JW-28KB



Expansion rack panel: JW-28ZB



Note 1: Put a connector cover on unused slots to prevent dust from entering both basic and expansion rack panel. At the delivery, they are covered by connector covers to keep out dust both basic and expansion rack panel.

Note 2: Screw holes are drilled for fitting modules at the bottom of basic/expansion rack panel in each fitting position. Only the control module uses retention screw at the bottom and upper part in the module. Other modules including input, output, special, option, and power supply modules keep their position using retention screws on the top and retention ribs at the bottom.

[2] I/O expansion cable

The I/O expansion cable connects the basic rack panel and the expansion rack panel, or the expansion rack panel with another expansion rack panel.

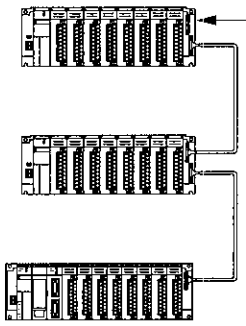
The I/O expansion cable corresponds signals between each rack panel.

There are 5 different cables in its length, as follows :

Model name	Cable length	Remarks
JW-203EC	30 cm	With 5 VDC cable (30 cm)
JW-207EC	70 cm	With 5 VDC cable (70 cm)
JW-22EC	2 m	With 5 VDC cable (2 m) and a short connector
JW-25EC	5 m	With short connector, Without 5 VDC cable
JW-210EC	10 m	

I/O expansion cable is supplied separately. The short connector only (QCNCW 5252NCZZ) is also available separately.

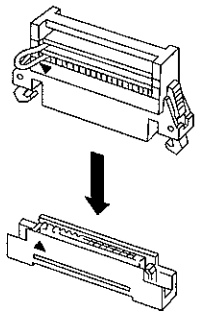
When connecting the I/O expansion cable, take care with the IN and OUT parts of each rack panel as follows. Mis-connection indicates "I/O table verify error 60_{HEX}" or "I/O table registration error 70_{HEX}" and the JW30H cannot start operation.



When using the JW-22EC/25EC/210EC with the I/O expansion cable, be sure to install a short connector (for termination resistance) in OUT side of the final expansion rack panel. Otherwise, an error may occur.

When using only JW-203EC/207EC, installation of short connector is unnecessary.

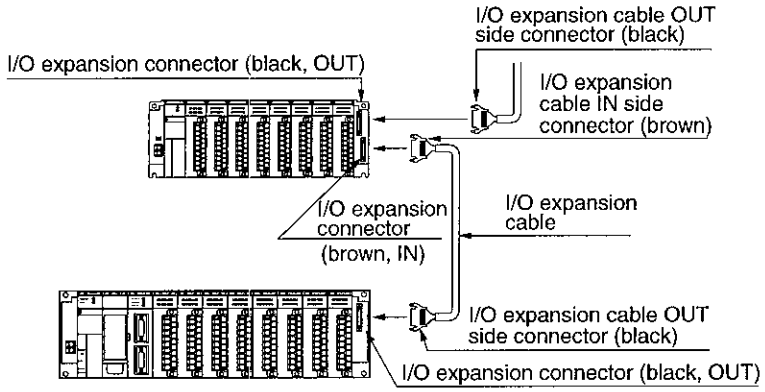
Short connector



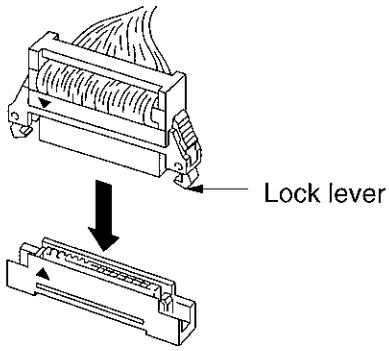
Allowable total length of the I/O expansion cable is 14 m max.

When connecting the I/O expansion cable with each rack panel, be careful of its installation position and direction, and fix firmly using lock lever.

Fitting position of I/O expansion cable



Fitting direction of I/O expansion cable



Note 1: When using the JW-25EC, JW-210EC as an I/O expansion cable, fix the shield line of the I/O expansion cable at fixing rack panel.

Note 2: When using the JW-25EC, JW-210EC as an I/O expansion cable, install a power supply module in the system regardless of power consumption.

[3] Cautions for basic /expansion rack panel

(1) Configuration of basic/expansion rack panel

The JW20H can increase or decrease number of installed input/output/special/option modules freely within the maximum number of input/output points.

The max. number of control I/O points in each control module

Module name	Max. No. of control I/O points
JW-21CU	128
JW-22CU	512

Installation of any module of the input/output/special/option at a same time in the basic rack panel is possible. Installation of any module of the input/output/special at a same time in the expansion rack panel is possible. However, installing the option module is not possible.

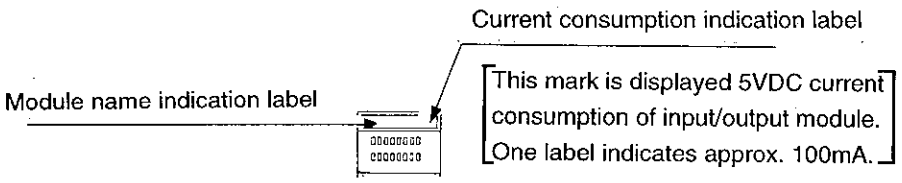
(2) Installation of power supply module in expansion rack panel

In case of the following conditions, furnish expansion rack panel with power supply module.

1. When total current consumption of each modules exceeds current capacity of a power supply module.

•When the total current consumption indication mark of modules supplied with one power supply module exceeds 35 pieces.

Note : In case of power supply module of basic rack panel, total current consumption indication mark taken out of support tool (JW-2PG etc.) connected with control module , memory module exceed 25 pieces.



2. When using JW-25EC/210EC, in the I/O expansion cable.

Furnish each expansion rack panel with power supply module.

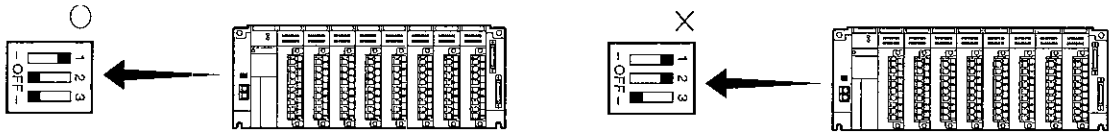
3. When the total length of same power supply group I/O cable with rack panel covered by the current capacity of one power supply module is shorter than 2.1 m.

(3) Rack No. of the expansion rack panel

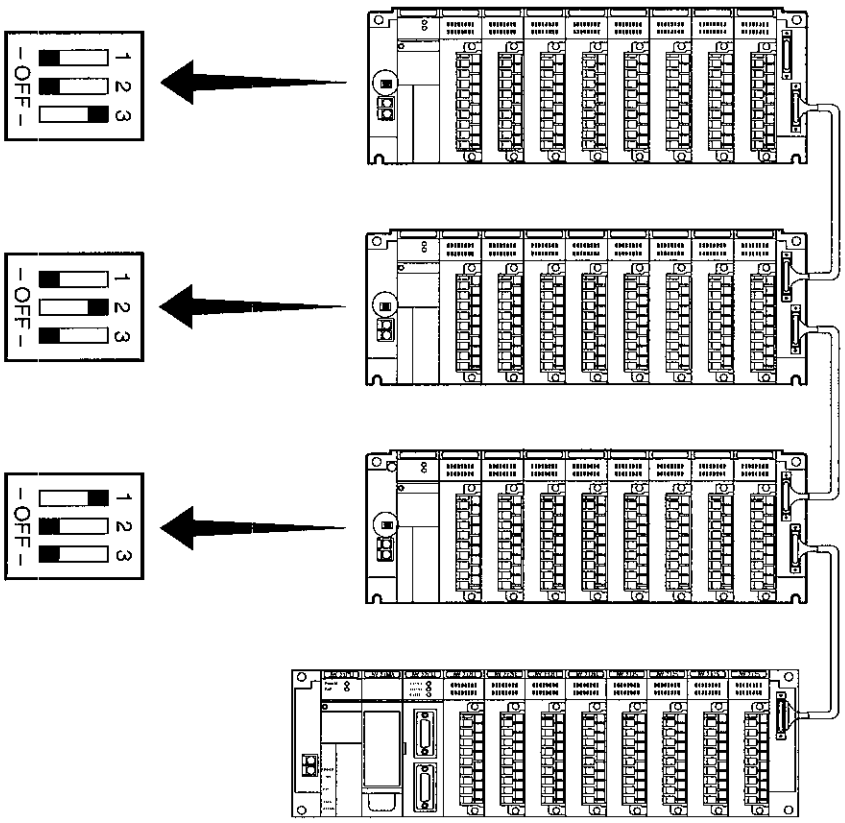
A switch to set the rack No. is installed in the expansion rack panel.

Set the switch and the address allocation order is designated.

Set the rack No. 1 to 3 in each expansion rack panel. Doubled setting may cause I/O registration error and the JW20H can not operate.



JW20H is a block building system, and its configuration is the rack system indicated below. Set the number from the bottom to top in order.



While setting rack number, don't set the following points. Otherwise an error will occur and the error code is in the system memory #160, and the JW20H can not operate.

1. To set double "ON" of the rack No. switch in the expansion rack panel.
2. No setting of the rack No. switch (the switch is still delivered condition).
3. Double setting of the rack No. in the system.

All the above items 1 to 3 may cause "table registration error 70" or "table verify error 60".

Note 1: Setting of the rack No. at delivery is "1". (the No.1 switch is "ON").

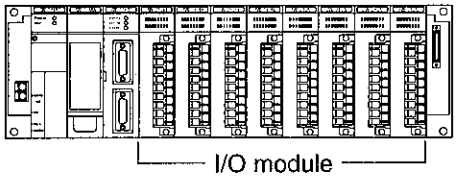
4-5. I/O module

The following models are available in the input/output module.
The input/output module can be installed in any order in the I/O module slot of the basic/expansion rack panel.

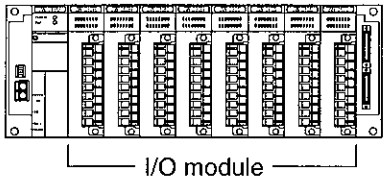
	Model name	Points	Specifications
Input	JW-201N	8	100/120 VAC
	JW-202N	8	12/24 VDC
	JW-203N	8	200/240 VAC
	JW-211N	16	100/120 VAC
	JW-212N	16	12/24 VDC
	JW-214N	16	12/24 VDC (high speed type)
	JW-234N	32	12/24 VDC (high speed type, connector connection)
Output	JW-202S	8	5/12/24 VDC, 1A, transistor output (sink output)
	JW-203S	8	100/200 VAC, 1A, triac output
	JW-204S	8	250 VAC/30 VDC, 2A, relay output (separated common)
	JW-212S	16	5/12/24 VDC, 0.5A, transistor output (sink output)
	JW-213S	16	100/200 VAC, 0.5A, triac output
	JW-214S	16	250 VAC/30 VDC, 2A, relay output
	JW-232S	32	5/12/24 VDC, 0.1A, transistor output (sink output, connector connection)
I/O	JW-232M	12/24 VDC input: 16 points, transistor output 16 points: 0.1A (sink output, connector connection)	
Special I/O	JW-264N	64	24 VDC (high speed type, connector connection)
	JW-262S	64	5/12/24 VDC, 0.1A, transistor output (sink output, connector connection)

I/O module having 8, 16, and 32 points are available.
Special I/O module having 64 points are available.

• Installation example of basic rack panel



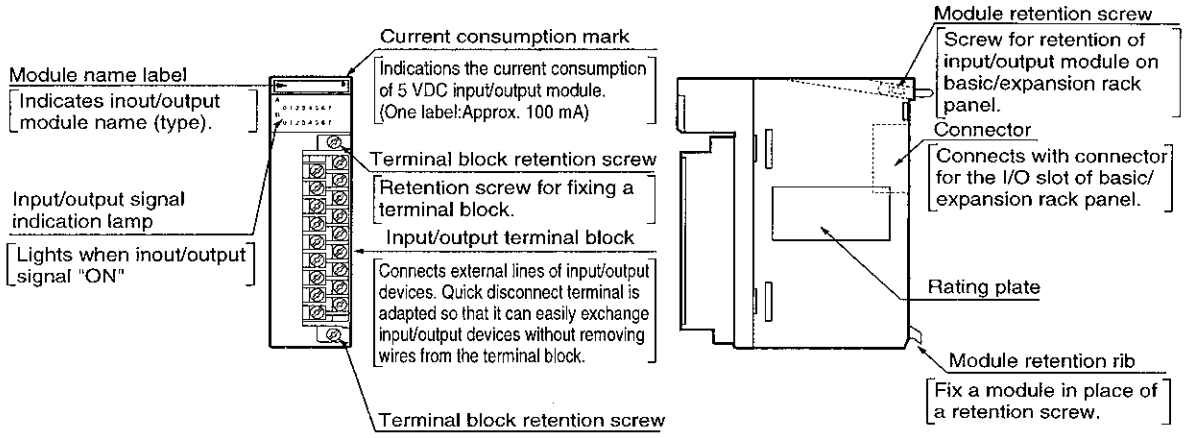
• Installation example of expansion rack panel



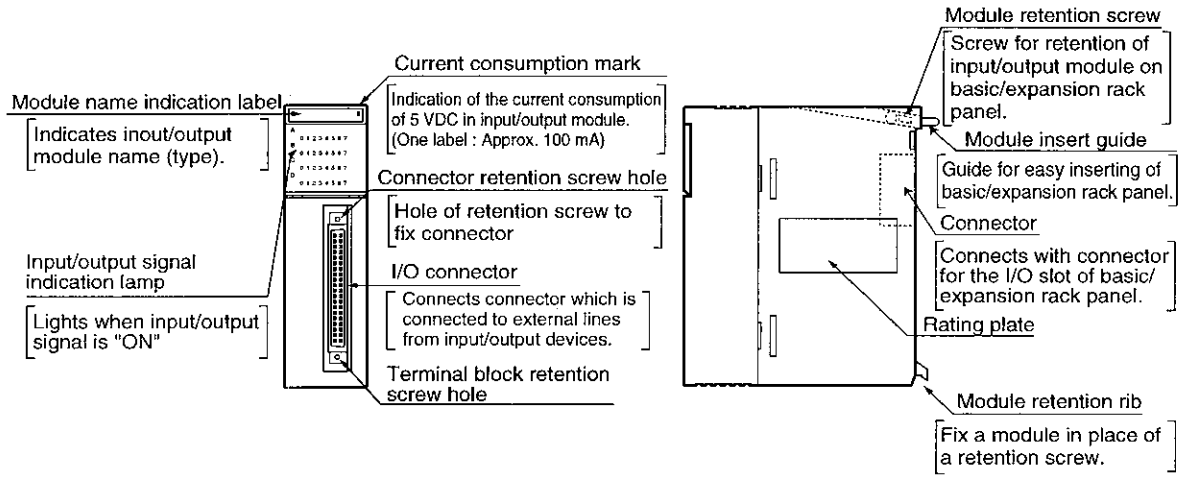
[1] Name and function of each part

Input/putput modules having 8, 16, 32, and 64 points are available.

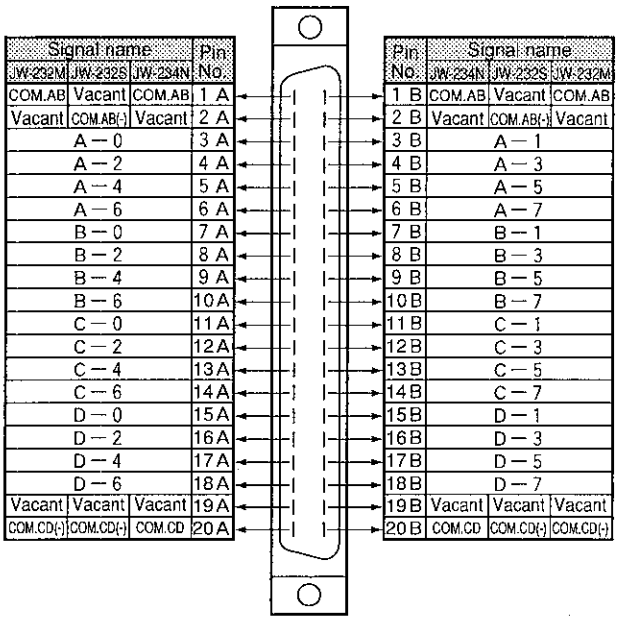
■ 8/16 points module



■ 32 points module

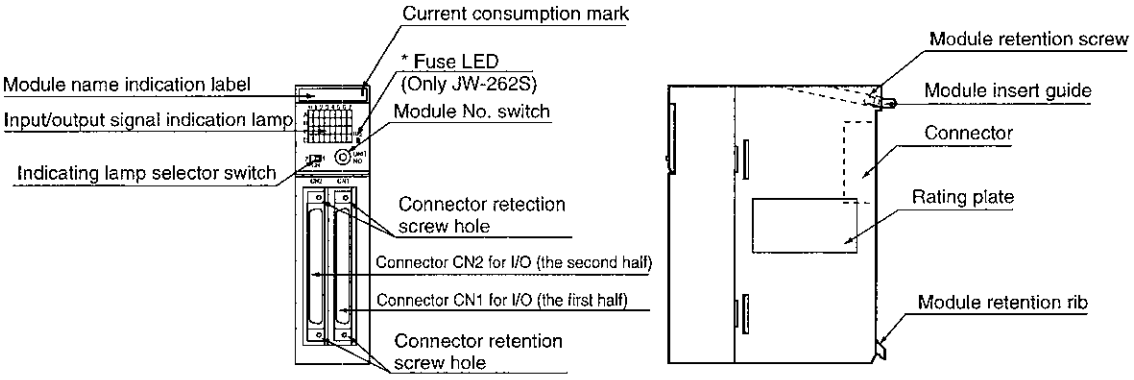


[Pin No. of I/O connector and signal name]



Signal name			Pin No.		Pin No.	Signal name		
JW-232M	JW-232S	JW-234N				JW-234N	JW-232S	JW-232M
COM.AB	Vacant	COM.AB	1	A	1	B COM.AB	Vacant	COM.AB
Vacant	COM.AB(-)	Vacant	2	A	2	B Vacant	COM.AB(-)	Vacant
A − 0			3	A	3	B	A − 1	
A − 2			4	A	4	B	A − 3	
A − 4			5	A	5	B	A − 5	
A − 6			6	A	6	B	A − 7	
B − 0			7	A	7	B	B − 1	
B − 2			8	A	8	B	B − 3	
B − 4			9	A	9	B	B − 5	
B − 6			10	A	10	B	B − 7	
C − 0			11	A	11	B	C − 1	
C − 2			12	A	12	B	C − 3	
C − 4			13	A	13	B	C − 5	
C − 6			14	A	14	B	C − 7	
D − 0			15	A	15	B	D − 1	
D − 2			16	A	16	B	D − 3	
D − 4			17	A	17	B	D − 5	
D − 6			18	A	18	B	D − 7	
Vacant	Vacant	Vacant	19	A	19	B Vacant	Vacant	Vacant
COM.CD(-)	COM.CD(-)	COM.CD	20	A	20	B COM.CD	COM.CD(-)	COM.CD(-)

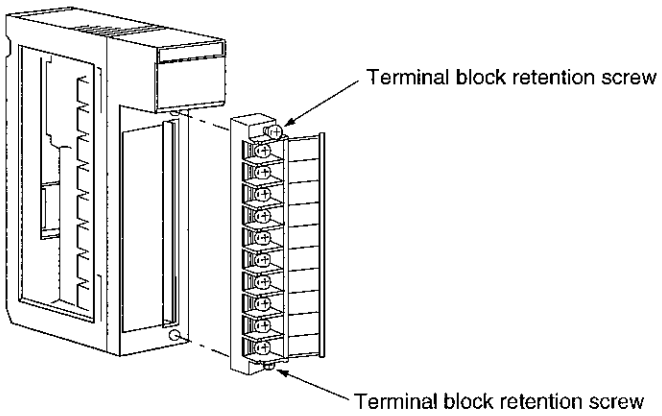
■ 64 points module



For Pin No. of connector and signal name, see page 157 and for allocation of relay No., see page 158.

[2] The terminal block in input/output module

The terminal block in 8/16-point input module is quick-disconnect type, and a malfunctioning input/output device can be replaced without removing the external wires from the terminl block.



A terminal block is retained by top and bottom screws. Loosing these screws, the terminal block can be removed from the input/output module.
The retention screws are attached to a terminal block with stoppers and cannot be removed from the terminal block.

4-6. Current consumption of modules

Each module in the JW30H operates by 5 VDC output current supplied by the power supply module: JW-21PU/22PU/31PU. The make up the system configuration plan is such that the total current consumption of each module does not exceed the current capacity of the power supply module. When the total current consumption of each module exceeds the supply capacity, the JW20H stops operation by the current limit function of the power supply module.
The current consumption in each module can be found using the following two methods:

1. Total numbers of a current consumption indication marks which are shown on stickers next to model indication label in each module.
2. Calculate the total current consumption.

■ Output current of 5 VDC power supply in power supply module

Model name	Output voltage	Output current
JW-21PU	5 VDC	3.5A
JW-22PU		
JW-31PU		

■ Current consumption of each module

① Control module

Model name	Current consumption:mA	No. of current consumption mark
JW-21CU (Control module)	150	———
JW-22CU(Control module)	150	

② Memory module

Model name	Current consumption:mA	No. of current consumption mark
JW-21MA (Memory module)	10	———
JW-22MA (Memory module)	10	
JW-21MO (Memory module)	10	
JW-21ME (Memory module)	10	

③ Support tools

Model name	Current consumption:mA	No. of current consumption mark
JW-13PG (Programmer)	200	———
JW-12PG(Programmer)	200	
JW-10PG/11PG (Programmer)	200	
ZW-101PG1 (Programmer)	700	
JW-2PG (Programmer)	200	

④ I/O ／ special I/O ／ I/O link ／ option module

	Model name	Current consumption : mA (when all points ON)	No. of current consumption mark
I/O	JW-201N (100/120 VAC input)	40	1
	JW-202N (12/24 VAC input)	40	1
	JW-203N (200/240 VAC input)	40	1
	JW-211N (100/120 VAC input)	60	1
	JW-212N (12/24 VDC input)	60	1
	JW-214N (12/24 VDC input)	60	1
	JW-234N (12/24 VDC input)	80	1
	JW-202S (5/12/24 VDC output)	190	2
	JW-203S (100/240 VAC output)	130	2
	JW-204S (Relay output)	380	4
	JW-212S (5/12/24 VDC output)	60	1
	JW-213S (100/240 VAC output)	260	3
	JW-214S (Relay output)	480	5
	JW-232S (5/12/24 VDC output)	320	3
	JW-232M (12/24 VDC input, 5/12/24 VDC output)	200	2
Special I/O	JW-264N (24 VDC input)	60	1
	JW-262S (5/12/24 VDC output)	300	3
	JW-21HC (High speed counter)	120	2
	JW-22HC (High speed counter)	100	1
	JW-24AD (Analog input)	90	1
	JW-22DA (Analog output)	75	1
	JW-21DU (ID control module)	400	4
	JW-22DU (RF-ID interface module)	400	4
	JW-21SU (Serial interface module)	170	2
	JW-21PS (Pulse output module)	150	2
I/O link	JW-23LM (I/O link master module)	120	2
	JW-23LMH (I/O link master module)	120	2
Option	JW-21CM (Link module)	125	2
	JW-22CM (Network module)	360	4
	JW-21MN (ME-NET module)	360	4
	JW-25CM (JW/O link module)	130	2
	JW-21RS (Remote I/O slave module)	140	2

(1) Calculation of current consumption (by current consumption mark)

Add up the total numbers of the current consumption mark on strickers next to the model name label.

One mark of current consumption means approx.100 mA.

To get current consumption by current consumption indication mark, follow the below conditions :

1. Count the marks of each module which is supplied power from a power supply module, and the total 25 or less (since total power consumption at max. of a control module, memory module, and the support tools is approx. 1A : 10 marks).
2. Count the current consumption indication marks of each module which is supplied power from an expansion power supply module, and the total number of the mark should be 35 or less.

[Example] Calculation of the total current consumption in the system configiration below:

Control module	: JW-22CU	
Memory module	: JW-22MA	
Programmer	: JW-13PG	
100/120 VAC input module	: JW-201N	8 sets
	: JW-211N	8 sets
100/240 VAC output module	: JW-203S	8 sets
	: JW-212S	8 sets

	No. of marks
JW-22CU	
JW-22MA	10
JW-13PG	
JW-201N	8
JW-211N	8
JW-203S	16
JW-212S	8
Total	50

The number of total current consumption marks is 50 in the above system configuration, and another power supply module is required in the expansion rack panel.

(2) Calculation of current consumption (by calculating current consumption)
As the calculation example, calculate current consumption taking the system configuration in the example of (1).

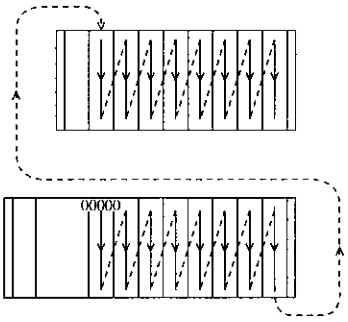
JW-22CU	0.15A
JW-22MA	0.15A
JW-13PG	0.2A
JW-201N	$0.04 \times 8 = 0.32$A
JW-211N	$0.06 \times 8 = 0.48$A
JW-203S	$0.13 \times 8 = 1.04$A
JW-212S	$0.06 \times 8 = 0.48$A
	Total 2.82A

The total current consumption is 2.82 A, and another power supply module is not required in the expansion rack panel.
As indicated above, the total current consumption calculation method requires no more power supply module, but the current consumption mark method requires another power supply module. Therefore, get total current consumption using calculation method for determine system configuration. The mark counting method gives only a rough estimate.

4-7. Allocation of the relay No.

The relay number in the JW20H is allocated by registering I/O table through an support tool in the order of installing the input/output/special/option module on the basic/expansion rack panel.
The I/O table must be registered prior to operating JW20H, I/O table registration makes register module name and number of points installed for each rack and slot number in the control module.
The registered I/O table is verified by self-diagnosis function. After verification, when the registered I/O table is different from the actual modules, FAULT lamp lights and the JW20H stops operation, storing an error code "60(table verify error)" in the #160 system memory.
The I/O table also must be registered after changing modules. For registration method of I/O table, see page 2.

After I/O registration, relay number are allocated, be numbering the top relay as the start point (00000), to next control modules one by one. The relay numbering order is top to bottom and left to right.
Top address in the next expansion rack panel succeeding the last address of the basic rack panel, or top address of the next expansion rack panel succeeding the last address of the expansion rack panel is allocated following the rack number switch of the expansion rack panel. (See page 38 " Rack number of expansion rack panel".)

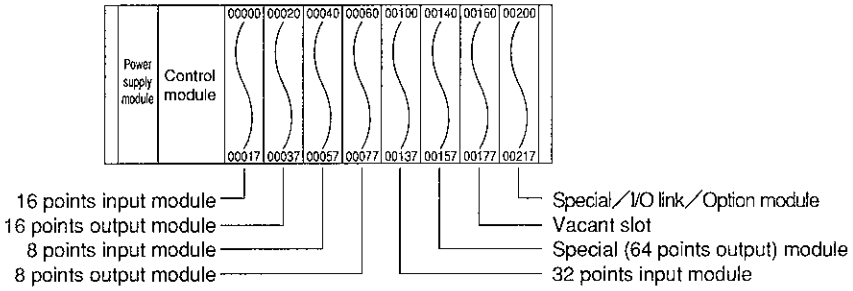


When JW20H is installed in the basic/expansion rack panel for each module, the JW20H allocates following points.

I/O relays allocated to each module

Kinds of module	Allocation No. of points	Contents of allocated relay No.
8 points input/output	16	Instead of 8 points, 16 points are assigned. • The first half 8 points is acceptable for input/output and the second half 8 points is unacceptable area for this module.
16 points input/output	16	Acceptable for 16 points as I/O module.
32 points input/output ／ I/O	32	Acceptable for 32 points as input, output, and I/O module.
Special I/O (64 points input/output)	16	Although 16 points are assigned, this is a dummy area not used in this module. • In the 64 points I/O module, the relay area for special I/O module can be used as I/O module.
Special I/O (except for 64 points)	16	Although 16 points are assigned, this is a dummy area not used in this module.
I/O link		
Option		
Vacant slot	16	Allocation for 16 points.

(Example of installation)



The empty slot refers to the shaded area when no module is installed between slots that do have modules installed, as shown in figure 1.
If no module is installed in the right slots, as shown in figure 2, the module in the shaded area is not referred to as an empty slot.

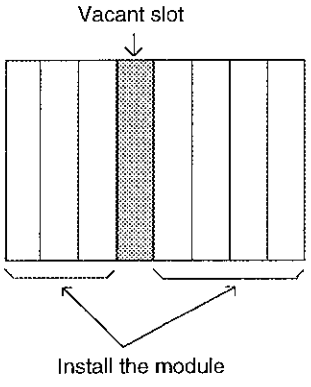


Figure 1

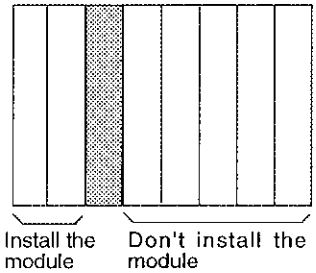


Figure 2

4-8. Communication Port (JW-22CU)

[1] Communication Port

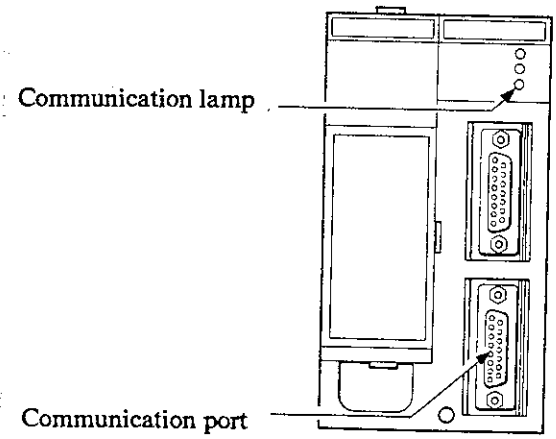
Only the JW-22CU has Communication Port installed as a standard.

The Communication Port can communicate with a host computer and other equipment having the RS232C/422 I/O port.

It has the same function as SHARP's Computer Link.

The Control Module: JW-22CU has a communication lamp. The lamp blinks while communicating with a personal computer, to easily confirm the communication.

A connector to connect the Communication Port is 17JE-23150-02(D8A): made by DDK (Daiichi Denshi Kogyo) Corporation.



(1) Available instructions

The following instructions are available for communicating between the JW-22CU and a personal computer. There are 3 type of instructions; reading instructions, writing instructions and control instructions.

Reading instructions: A message from a personal computer to the JW-22CU, prior to a personal computer reads data in the JW-22CU.

Writing instructions: A message from a personal computer to the JW-22CU, prior to writes data in the JW-22CU.

Control instructions: A message from a personal computer to the JW-22CU, prior to control the operation of the JW-22CU.

Reading/ Writing instructions

	Reading instruction	Writing instruction
Relay	MRL	SRR (set, reset)
Timer, counter, MD	MTC	SRT (set, reset)
Register	MRG	WRG, FRG (writing the same data)
System memory	RSM	WSM
Program setting	RPM	WPM CTC (changing timer or counter value)
Clock		
Date	MDY	SDY
Time	MTM	STM (setting), ACL (adjustment of a clock)

■ Control commands

HLT	Stop operation of PC
RUN	Re-start operation of PC
MPC	Monitoring PC operation
VLM	Reading memory size
EWR	Setting writing mode
SWE	Reading a state of writing mode

Note 1: Switch OFF (write enable) the memory protect switch prior to execute writing command for system memory or program.

Note 2: A global addressing function is not available (a command function, setting a station address to 00 and writing in all the PC by SSR, SRT, WRG, and FRG command).

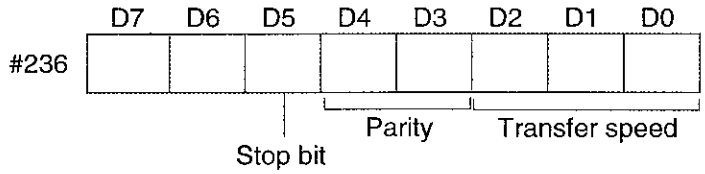
Note 3: There is no operational priority between support tools like programmer and communication port. Therefore, the JW20H can re-start operation by the RUN command through the communication port after being stopped by a support tool. However, when write protect (monitoring mode) is executed by a support tool writing by the communication port becomes unavailable.

(2) Communication format

The system memory of the JW-22CU stores a communication format for communicating with a personal computer.
The system memory to set communication format conditions is #236 and #237. The following are setting contents :

System memory number	Contents
#236	Transfer speed, parity, stop bit
#237	Station number, 001 to 037(8)

• Setting system memory #236
Set transfer speed, parity and stop bit in system memory #236.
Setting by switch ON/OFF in each bit.



Transfer speed (D0 to D2; 0 : OFF, 1 : ON)

D2	D1	D0	Transfer speed
0	0	0	19200 bits/s
0	0	1	9600 bits/s
0	1	0	4800 bits/s
0	1	1	2400 bits/s
1	0	0	1200 bits/s
1	0	1	600 bits/s
1	1	0	-
1	1	1	-

Parity (D3 to D4; 0 : OFF, 1 : ON)

D4	D3	Parity
0	0	None
0	1	Odd
1	0	Even
1	1	-

Stop bit (D5 ; 0 : OFF, 1 : ON)

D5	Stop bit
0	1 bit
1	2 bits

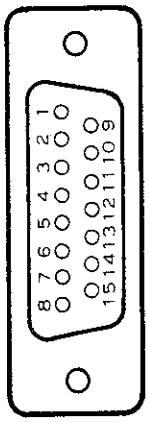
Data is 7 bits fixed.

• Setting system memory #237
System memory #237 is stored the number of commnicating station (001 to 037(8)) by octal notation.

(3) Wiring

• The pin number and signal name of the Communication Port connector

Signal name	Pin No.	Pin No.	Signal name
FG	1	9	-
SD	2	10	SD(+)
RD	3	11	SD(-)
RTS	4	12	RD(+)
CTS	5	13	RD(-)
-	6	14	RDS
SG	7	15	-
-	8		



The JW-22CU can communicate with either RS232C or RS422 personal computers. But the pin no.s of the Communication Port between RS232C and RS422 are different.

Refer to the following details for the proper wiring:

• Communication using RS232C

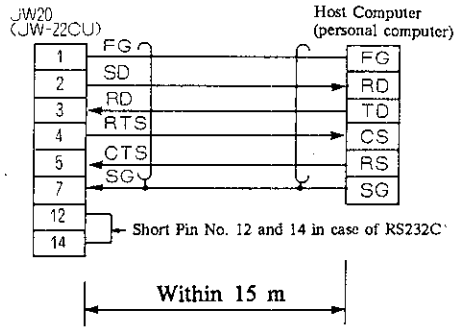
Pin No.	Signals	Functions
1	FG	Outside body grounding
2	SD	Sending data (PC to personal computer)
3	RD	Receiving data (Personal computer to PC)
4	RTS	ON While PC is supplied power source
5	CTS	ON: PC available sending OFF: Sending prohibited
7	SG	Signal Grounding
12,14		Short circuit terminals

• Communication using RS422

Pin No.	Signals	Functions
1	FG	Outside body grounding
10	SD(+)	Sending data (PC to personal computer)
11	SD(-)	
12	RD(+)	Receiving data (Personal computer to PC)
13	RD(-)	

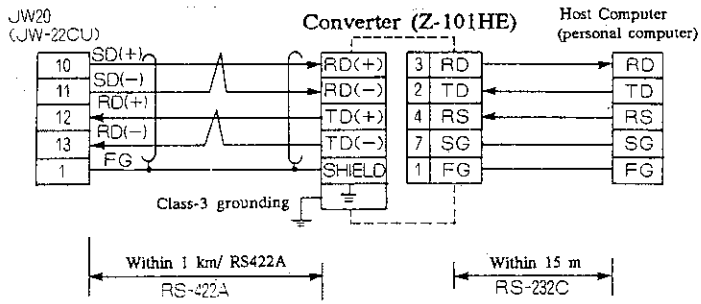
Wiring method

• When using RS232C for personal computer communications:



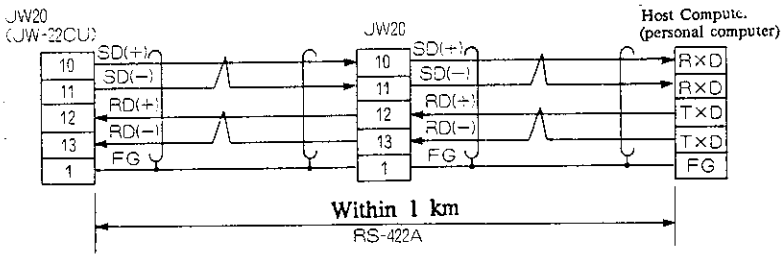
Total length of a communication cable: within 15 m
Recommended cable: Multi-wiring vinyl chloride insulation sheath cable, 7PX7/0.18 57VV-SB, made by FJIKURA LTD.

• The total length of the communication cable is more than 15 m:



Total length of the communication cable:
RS232C; Within 15 m
RS422A; Within 1 km
Recommended cable: CO-SPEV-SB0.5, made by HITACHI CABLE LTD.

• Communication mean is RS422A:



The total length of the communication cable: 1 km
Recommended cable: CO-SPEV-SB0.5, made by HITACHI CABLE LTD.

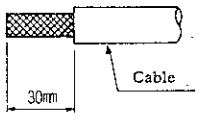
Note 1 RS232C/422 Converter (Z-101HE) converts RS232C signals from a personal computer to noise-proof RS485 signals.

Assembly and connection of a connector

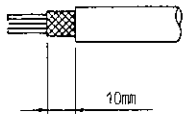
• Assembling connector

(1) Strip outer sheath of communication cable to be connected to connector.

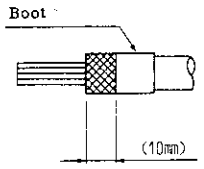
• Refer to wiring method for the recommended cable



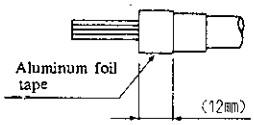
(2) Cut off the shield wire's net.



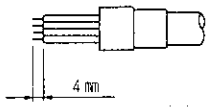
(3) Insert a boot, and fold the shield wire's net to cover boot.



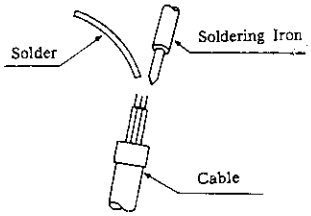
(4) Cover with aluminum foil tape the folded shield wire's net .



(5) Strip core wire



(6) Solder on the naked wires.



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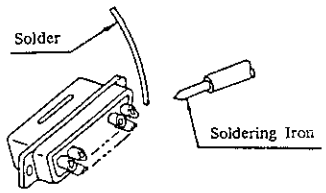
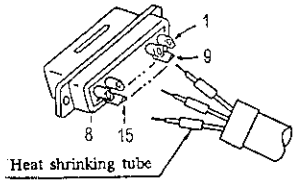
(7) Solder the using pins of the connector for Communication Port .



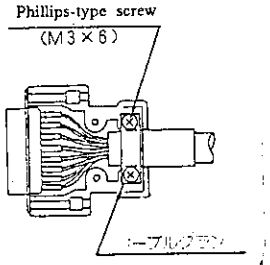
(8) Insert heat shrinking tube to cables and to connect pins.

↓

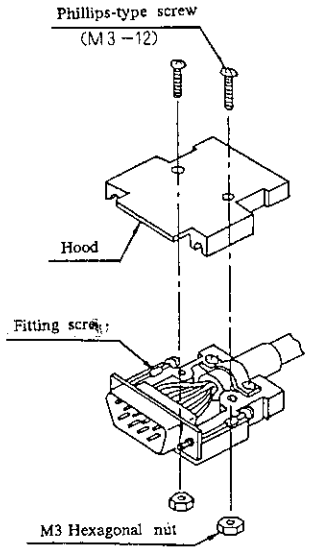
(9) Cover soldering pins and cables with a heat shrinking tube for insulation.



(10) Fit the connected connector on a connector hood and fix communication cable using a cable clamp and screws (M3x6)



(11) Cover another connector hood and set with screws (M3x6) and nuts.



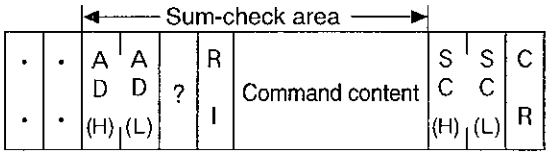
(12) Connect connector to the Communication Port and fix the connector using retention screw.

[2] How to use the communication port

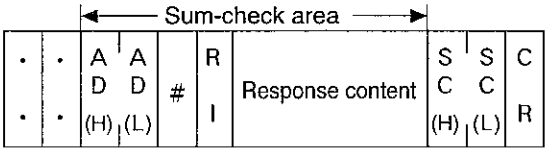
A message from a host computer or personal computer to the JW20H (control module : JW-22CU) is called "command" , and a message from the JW20H to a personal computer is called "response". (See page 49 Communication port).

When a command fro a personal computer is received, the communication port operates according to the received command, and sends the response. When an error occurs while processing, it returns error response. Shown below in the command and response format:

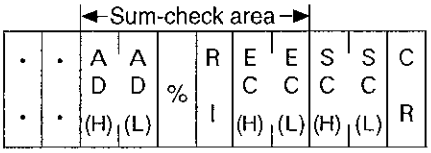
Command: A message from a personal computer to JW20H



Response: A message from JW20H to a personal computer (in normal operation)



Error response (error contents from JW20H to personal computer)



Contents of format

Data	Using code (ASCII character)	Contents
* AD (H) AD (L)	00 to 37 $_{OCT}$	Station No. • In command, the station address to be received command. • In response, the station address to send response.
RI	0 to F $_{HEX}$	Response time (Set the time from receiving a command to responding.)
* SC (H) SC (L)	00 to FF $_{HEX}$	Add the sumcheck code.
* EC (H) EC (L)	00 to 1F $_{HEX}$	Indicate error content. Refer to as follows.

Indentification symbol	ASCII code	Contents
: (colon)	3A $_{HEX}$	Hedder (Indicates beginning of command and response.)
? (question)	3F $_{HEX}$	Indicates command line.
# (number mark)	23 $_{HEX}$	Indicates response at normal.
% (percent)	25 $_{HEX}$	Indicates response at error.
CR (carriage return)	0D $_{HEX}$	Indicates termination of a command and response.

* (H) indicates upper digit, (L) indicates lower digit.

For each communication format of write/read command, control command (page 49, 50) , see page 165 to 170. For the communication format in detail, refer to the JW-21CM users manual as same as each command of JW-21CM computer link.

• Contnts of error code sending to personal compuer is as follows.

Error code ($EC_{(H)}$, $EC_{(L)}$)	Contents
01	Format error
02	Designated address is not TMR/CNT setting value
05	Number of transfer bytes is not correct
06	PC does not stop by HLT (stop PC processing)
07	Writing to PC memory is not executed correctly
08	Memory capacity, file capacity is full
0A	Parity error
0B	Framing error
0C	Overrun error
0D	Sumcheck error
0E	Prohibit program memory write (memory protection switch "ON")
0F	Other CPU is accessing memory
10	Not match write mode
11	Not program area
12	Tried to write in ROM
1B	System memory error

(1) Sum-check

The communication port detects error using sum-check as well as parity check in order to increase the reliability. The sum-check used here is as follows:

① Add data from formatting AD(H) to the last data of the command contents (just before sumcheck code) that are summed up in ASCII code.

② Convert the sum-check code (2 digits hexadecimal) to 8 bits data and add ① to the result. When the grand total is "0" (disregarded figure up), the message is regarded as correct, when the grand total is not "0," the message is regarded as an error.

■ How to create a sum-check code

Procedure the sum-check code as follows:

① Add data from station No. to the last data of the command contents or response contents (just before sumcheck code) that are summed up in ASCII code.

② Operate complement number of 2 of the result of 1.

③ Divide upper 4 bits and lower 4 bits and convert them to ASCII code.

Response 1: Complement number of 2,
Turn over all the bits indicated by the binary system (0 to 1, 1 to 0) and add 1. For example, the complement number of 2 of 4E in hexadecimal is B2 as follows :

$4E_{HEX}$ → 01001110
↓ Invert each bit
10110001
↓ Add 1
10110010 → $B2_{HEX}$

Note: When sum-check is not necessary in the sending command from the personal computer or difficult to procedure sum-check code in the personal computer, the JW20H does not execute sum-check, when 2 "@" are portioned at sign: 40(HEX) at the SE(H) and SC(L) location in the command line. In return response, sum-check code is also added disregard in the personal computer.

(2) Response time

When a personal computer is interpreter system, it executes programs one by one while interpreting. This personal computer may not have finished its process before receiving the response from the JW20H. As a countermeasure, the JW20H has a parameter for setting the response time in command line. Using the parameter, the response delay time can be set max. 600ms. Setting this parameter, a slow processing personal computer is also compatible with the JW20H. As the JW20H accesses memories after one operation cycle, the actual response time is the total of setting value of line in command and the waiting time of one operation cycle.

Response time : RI; one digit hexadecimal number (0 to F)

	Response time (ms)		Response time (ms)
0	0	8	80
1	10	9	90
2	20	A	100
3	30	B	200
4	40	C	300
5	50	D	400
6	60	E	500
7	70	F	600

The JW20H processes reading and writing commands at one time at the timing of memory access. Accorfingly, the one operation time becomes long for just the time of memory accesses.

Reference: Setting response time

It is difficult to recommend the optimum response time, as the optimum response time is varied depending on the model of personal computer, the programming language and the system program. First, set a fairly long time, then, shorten gradually.

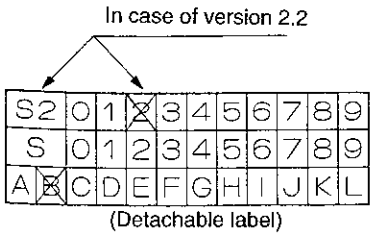
Note 1: There are some limits for handling bit numbers by commands and for the communication buffer of personal computers. Be careful for handling bit numbers and communication buffers.

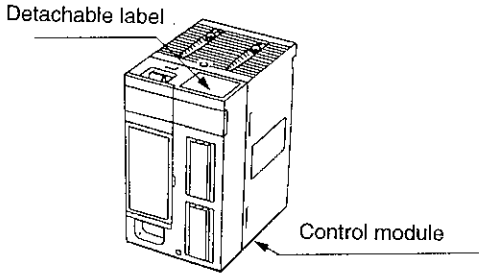
Note 2: Set 20ms waiting time for sending the next command after receiving a response. This waiting time is inevitable for the communication port to change the sending mode to receiving mode.

ROM version of JW-21CU/22CU	Waiting time
2.2 or more	20ms
2.0 or less	20ms + PC scan time (maximum)

• Check method of ROM version

Check the detachable label on upper part of control module.





Chapter 5. Installation

5-1 Precautions in installation

The JW20H is not designed for dust and water proof construction.
Therefore, install JW20H in an enclosed panel.
Avoid keeping the JW20H in the following conditions:

1. Ambient temperature extremes outside the range of 0 to 55 °C
2. The relative humidity exceeding the range of 35 to 90%
3. Sudden temperature changes which may cause condensation.
4. Corrosive and flammable gases.
5. Water, oil and organic solvents dripping positions.
6. Dusts, iron and salty conditions.
7. A box in which high voltage device is installed.
8. Strong vibration and shock may usually occur.

Install on a good conductivity metal plated panel instead of painted one for easy grounding and better noise tolerance.
Use zinc plated retention screws of M5 for installing JW20H.

Calculation the avarage comsumption electric power (heating value) of JW20H.
Determine the average power consumption of the entire machine in the following formula, and calculate the temperature rise in the panel.

1) Power supply module
   Wpw = × (I_{5V} × 5) (W)
   I_{5V}: Current comsumption of 5 VDC circuit of respective module
2) Tatal comsumption electric power of respective module (5 VDC)
   $W_{5V} = I_{5V} \times 5$ (W)
3) Average comsumption electric power of total 24 VDC power supply of output module (power consumption for simultaneous ON points)
   $W_{24V} = I_{24V} \times 24$ (W)
4) Average power consumption by output port drop voltage of output module (power consumption for simultaneous ON points)
   Wour = Iour × Vdrop × No. of output points × Simulataneous ON rate (W)
   Iour: Output current (current of use) (A)
   Vdrop: Drop voltage of respective output module (V)
5) Input port average power consumption of input module (power consumption for simultaneous ON points)
   - In case of DC input
     $W_{IN} = I_{IN} \times E \times$ No. of input points × Simulataneous ON rate (W)
   - In case of AC input
     $W_{IN} = 0.1 \times I_{IN} \times E \times$ No. of input points × Simulataneous ON rate (W)
     I_{IN} = Input current (Rms value in the case of AC) (A)
     E = Input voltage (voltage of use) (V)
6) Comsumption electric power of special function module
   $W_S = I_{5V} \times 5 + I_{24V} \times 24$ (W)

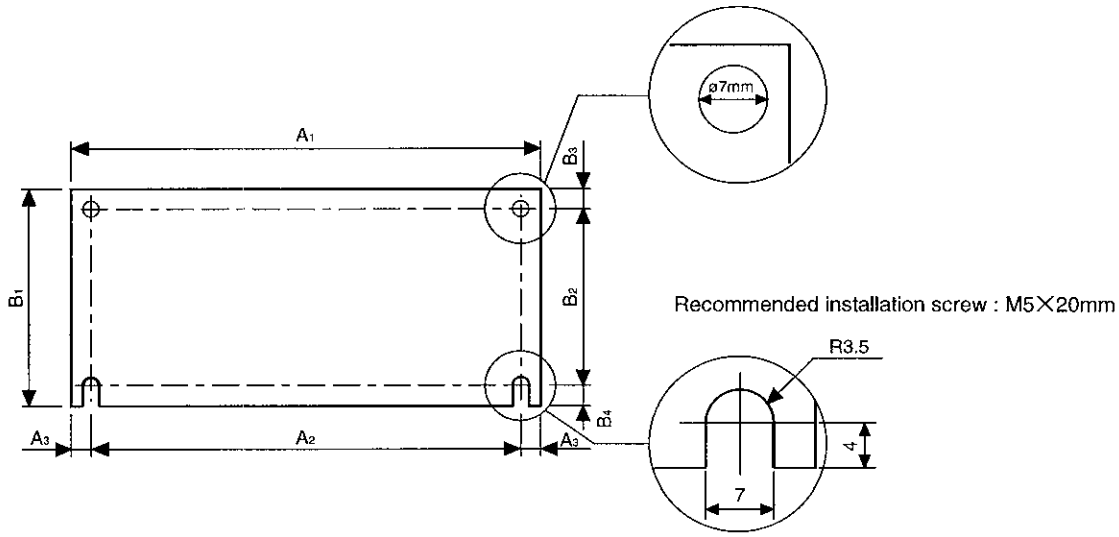
The total of the power consumptions calculated in each module is the power consumption of the entire machine. From this entire power consumption (W), calculate the heat generation and temperature rise in the panel.

5-2. Installation of basic/expansion rack panel

This section explains the installation method of the basic/expansion rack panel in a control panel.
Fix the basic/expansion rack panel on a partition plate of a control box. Select the appropriate fixing place taking into consideration the size of a wiring duct, wiring to the JW30H, a cable length of the I/O expansion cable, ventilation, maintenance, easy access for exchanging modules etc.
We recommend that you install the basic rack panel at the bottom and the expansion rack panel above the basic rack panel.

Note: Use a high conductive partition plate of plating finish for fitting the basic/expansion rack panel so as to increase noise tolerance.

■ Installation dimensions of basic/expansion rack panel



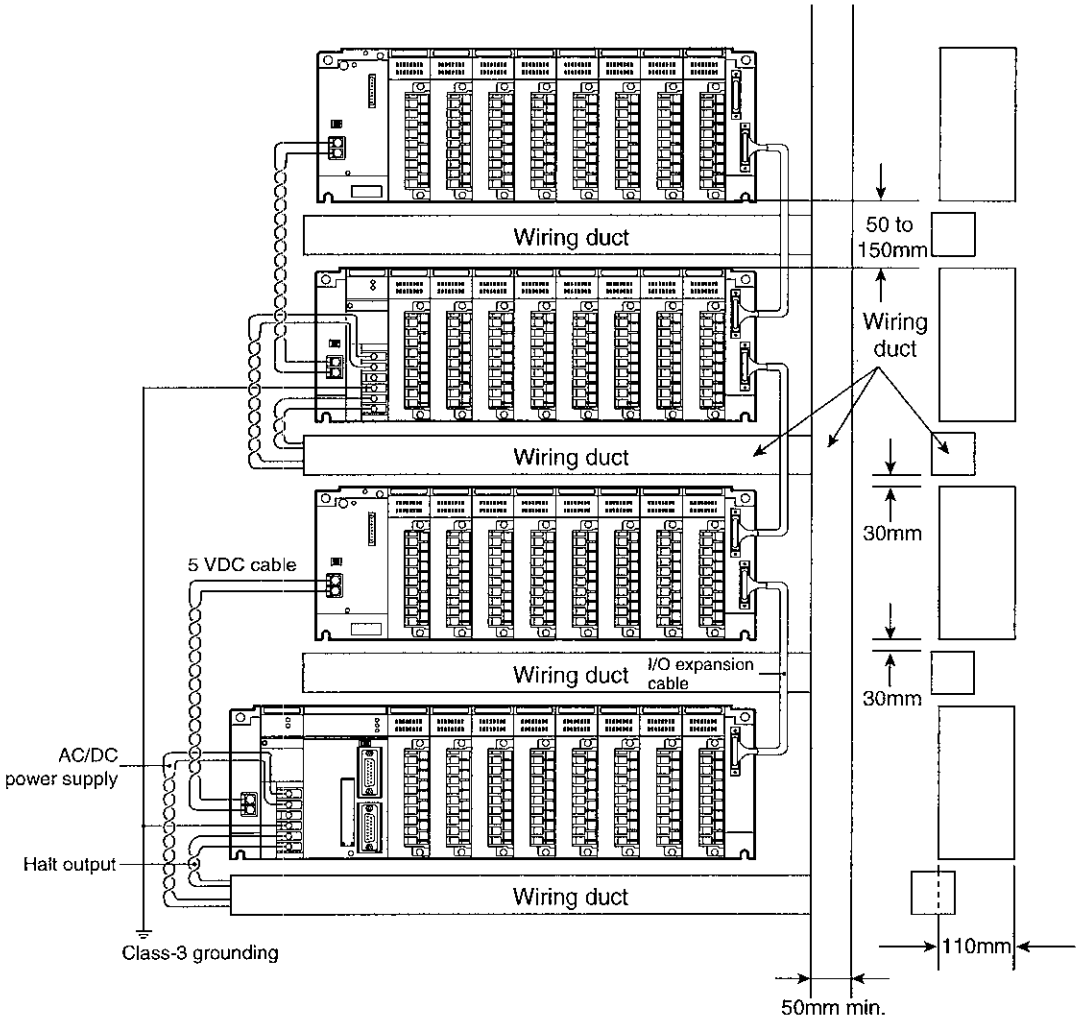
Basic rack panel	Installation dimensions (mm)						
	A_1	A_2	A_3	B_1	B_2	B_3	B_4
JW-24KB	297	281	8	130	118	8	4
JW-26KB	768	352	8				
JW-28KB	437	421	8				

Expansion rack panel	Installation dimensions (mm)						
	A_1	A_2	A_3	B_1	B_2	B_3	B_4
JW-24ZB	226	210	8	130	118	8	4
JW-26ZB	297	281	8				
JW-28ZB	368	352	8				

■ Installation of basic/expansion rack panel in control panel

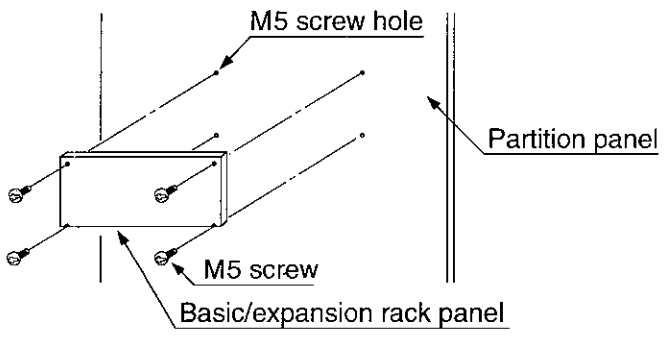
① Drill fitting holes of basic/expansion rack panel and wiring duct on the control panel and partition plate.

- Refer to page 5.2 for fitting dimension of the basic/expansion rack panel. Keep each rack panel at 50 to 150 mm distance and more, from right and left sides of each rack panel to the end of the panel and the wiring duct for 50 mm and more.
- Keep wiring duct 30 mm distance or more from the basic/expansion rack panel for vertical directions.



② Fix basic/expansion rack panel on partition plate using M5 screws.

- Prepare M5 retention screws locally. (Recommended installation screw: M5 × 20 mm)



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③ Fit wiring duct

- Prepare the retention screws locally.
- Use a wiring duct to enable easy external wiring for the I/O／special I/O／I/O link／option module of the JW20H. A fitting base of a wiring duct having the same level of the duct enables ease of external wiring.

④ Set the rack no. switch of expansion rack panel.

- See page 38 " Rack No. of expansion rack panel" for setting a rack no. switch..

⑤ Connect I/O expansion cable to basic/expansion rack panel .

- I/O expansion cable is to receive signals of each module. Be sure that the total length of the cable does not exceed 14 m .
  See page 69 "Installation of I/O expansion cable" for connecting the I/O expansion cable.

⑥ Install JW20H system configurating modules to basic/expansion rack panel.

- See page 64 "Installation of power supply module" to page 68 "Installation of module cover" for installation of each module (power supply module, control module, input module etc.)

⑦ Fit partition plate when installing basic/expansion rack panel to control panel.

- Prepare the retention screws locally.

⑧ Ground the partition plate securely after installation.

- See page 72 " Caution for wiring" for grounding.

5-3 Installation of Power Supply Module

This section explains installation method of the Power Supply Module to the Basic/Expansion Rack Panel.

Be sure to install the Power Supply Module on the Basic Rack Panel. Specify the Expansion Rack Panel according to required Power Supply Module, after calculating the current consumption in each module.

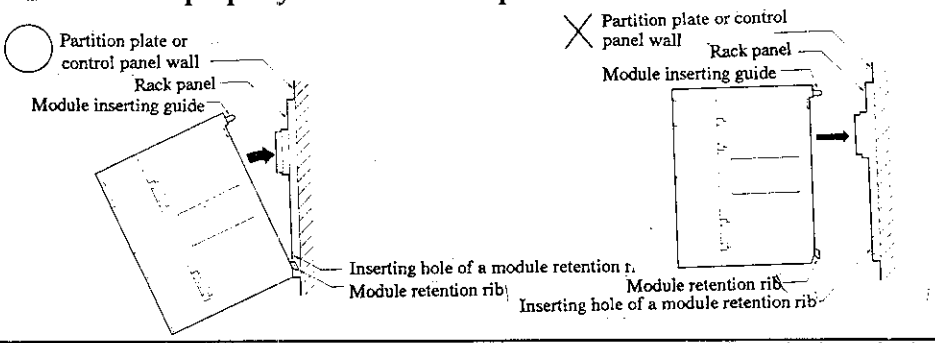
See page 43"Current Consumption of Modules" for calculation method.

Removing the Power Supply Module, following the reverse process of installation.

Installation of Power Supply Module to Basic/Expansion Rack Panel.

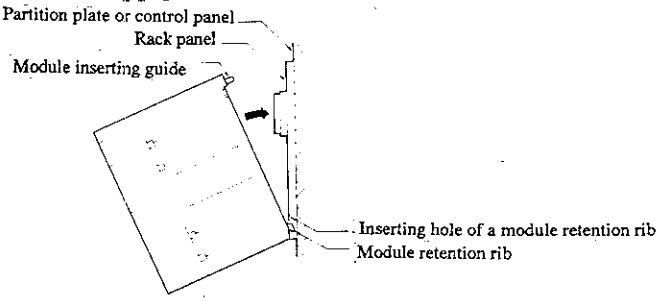
(1) Hang Power Supply Module, inserting retention rib at the back of the module, into an inserting hole on Basic/Expansion Rack Panel.

- Without hanging the retention rib of the Module, the Power Supply Module can not be fixed properly on the Basic/Expansion Rack Panel.



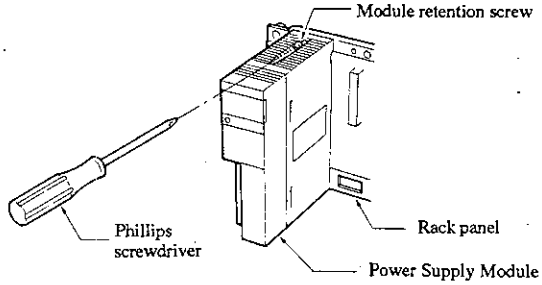
(2) Keep the module retention rib hanging on the inserting hole and push the whole body of the power supply module to the panel.

- When the Power Supply Module tilts forward after pushing, repeat the process from (1).



(3) Tighten retention screw in upper part of the Power Supply Module by Philips screwdriver.

- When the retention screw can not be tightened properly, repeat the process from (1).



5-4 Installation of Control Module

See page 29 "Installation of Memory Module on Control Module" and install the Memory Module, prior to installing the Control Module.

Install the Control Module at the right end of the Power Supply Module.

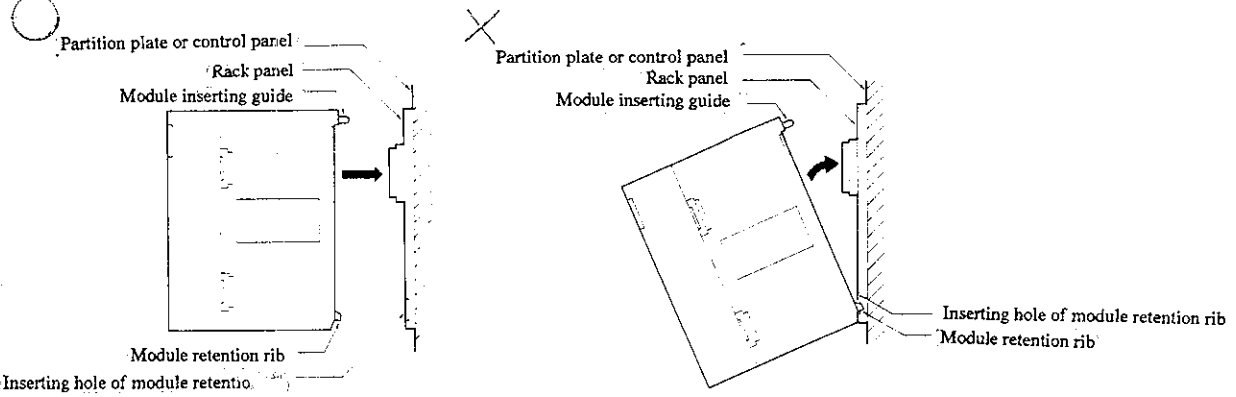
When removing the Control Module, execute the reverse process of installation.

When removing the Memory Module from the Control Module, execute the reverse process of page 29"Installation of Memory Module on Control Module."

Installation Process of Control Module to Basic Rack Panel.

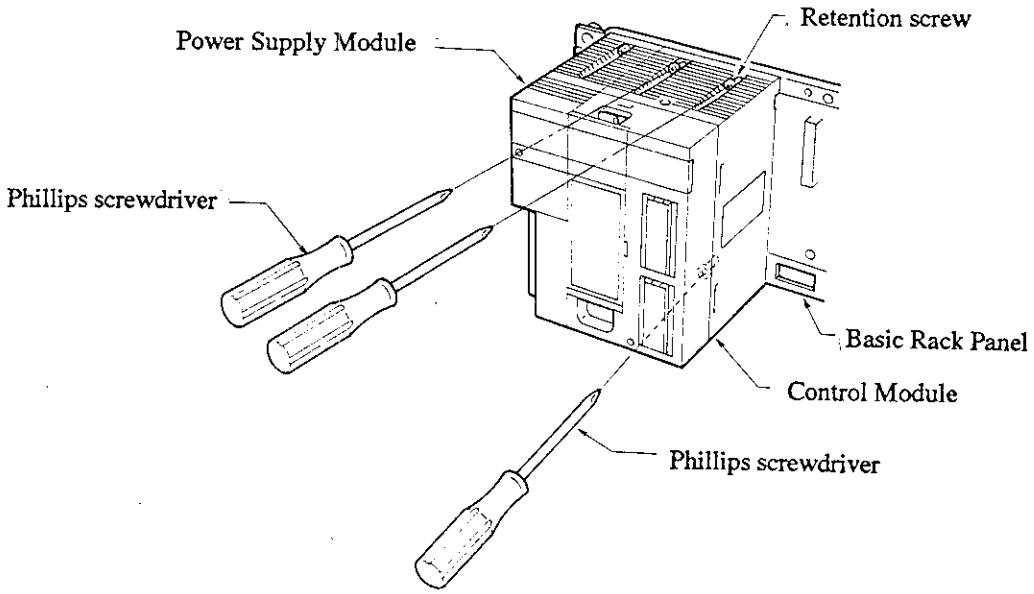
(1) Insert connector of Control Module into a slot for Control Module.

• When the module tilts after inserting, repeat above installation.



(2) Tighten retention screw on upper and bottom part of the Control Module using a Philips screwdriver.

• When the retention screw can not be tightened properly, repeat the process from (1).



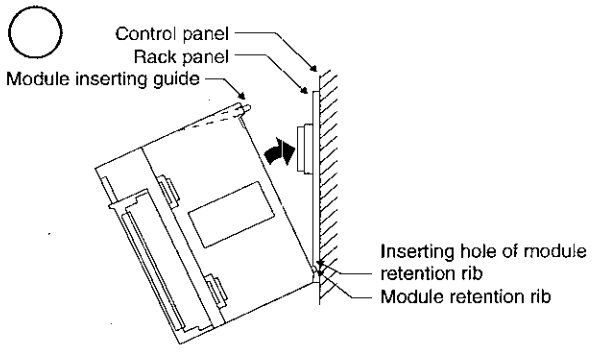
5-5 Installation of I/O／Special I/O／I/O Link／Option Module

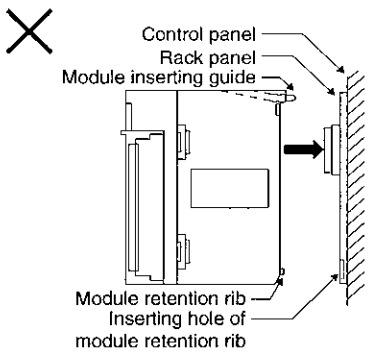
This section contains instructions for installing the I/O／special I/O／ I/O link／option module to the basic/expansion rack panel.
I/O／special I/O／ I/O link／option module can be installed together on basic rack panel. However, the option module cannot be installed on the expansion rack panel.
Prior to installation/removal of the I/O／special I/O／ I/O link／option module, switch OFF the power supply to the JW20H.
Do not neglect to install a serge killer such as varistor on the output line of the output module : JW-204S/JW-214S, as they do not have a serge absorbing circuit. Without installing a serge killer, a sparkling noise from a relay may cause noise trouble to other modules. See page 85, "Precaution for operating I/O modules" for installation of a serge killer.
Prior to installing the I/O ／ special I/O ／ I/O link ／ option module, calculate current consumption in each module. See page 43 "Current consumption of modules" for calculating current consumption.
Reverse the process in order to remove the I/O ／ special I/O ／ I/O link ／ option module.

■ Installtion procedure of the I/O ／ special I/O ／ I/O link ／ option module

① Hang I/O ／ special I/O ／ I/O link ／ option module, inserting the retention rib at the back of the module into inserting hole on basic/expansion rack panel.

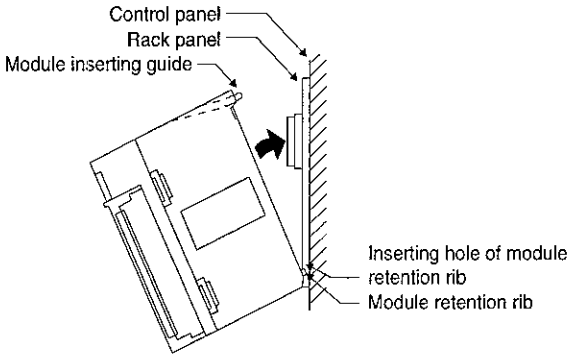
- Without hanging the module by inserting the retention rib, the I/O ／ special I/O ／ I/O link ／ option module can not be fixed properly on the basic/expansion rack panel.





② Keep the I/O ／ special I/O ／ I/O link ／ option module hanging on the module retention rib in the inserting hole and push the entire body of the power supply module to the panel.

- When the I/O ／ special I/O ／ I/O link ／ option module tilts forward after pushing, repeat the process from ①.



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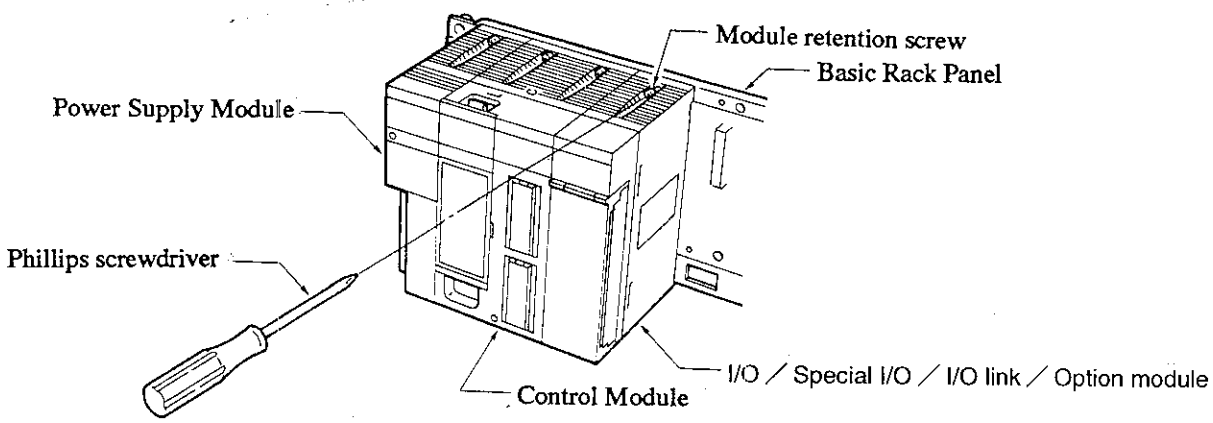
③Tighten fixing screw in upper part of the I/O／special I/O／I/O link／option module using philips screwdriver.

• When the retention screw will not tighten properly, repeat the process from ①.



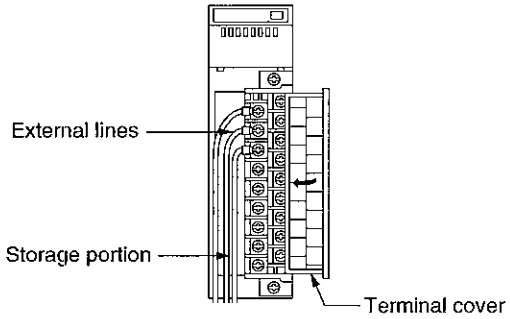
5-6. Installation of module cover

Module cover JW-20CV is a cover fitted on a terminal block of the Input ／ output ／ special ／ option module to which external cables are connected. By fitting the cover, external lines are arranged in good conditions.
Execute the procedure reverse for removing the module cover.

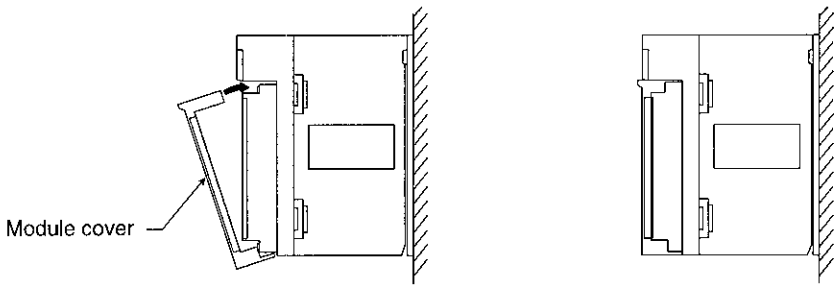
■ Installation of module cover

① Put the external lines connected to the I/O ／ special I/O ／ I/O link ／ option module into the portion reserved for storage portion.

- When the external lines can not be stored in the storage portion, repeat connecting the external lines to the terminal block.
- Put the terminal cover on after installing the external lines in the storage portion.



② Hang the screw at the lower part of the module cover on terminal block, and insert the upper part of the module cover between the LED display panel and the terminal block of the module.



Note: Module covers are ordered separately. Order them 8 sets in one pack.

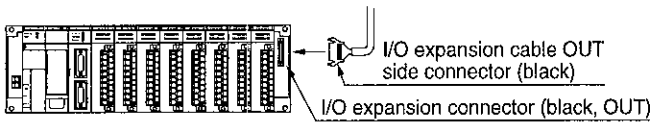
5-7. Installation of I/O expansion cable

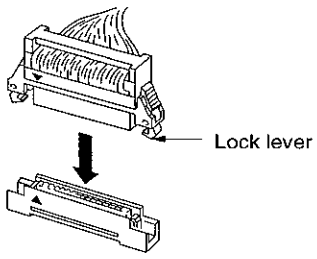
This section contains instructions for installing the I/O expansion cable between the basic rack panel and the expansion rack panel, or between the expansion rack panel and another expansion rack panel.
The I/O expansion cable is for receiving signals in each rack panel. When using the expansion rack panel, be sure to connect each rack panel using the I/O expansion cable.
When using the I/O expansion cable on JW-22EC/25EC/210EC, fix the shield line of the I/O expansion cable (green) together with the rack panel using the retention screw.
I/O expansion cable allows 10m between each rack panels, but do not exceed 14m for the total length of the I/O expansion cable.
See the procedure below for connecting each rack panel using the I/O expansion cable.
The JW20H does not operate when the I/O cable is not connected properly.
Do not put the I/O cable into a wiring duct. Otherwise, mis-operation may occur. Reverse the process, when removing the I/O expansion cable.

■ Installation of I/O expansion cable

① Connect I/O expansion cable connector (black, OUT side) to basic rack panel connector (black, OUT side), and fix them to each other by lock lever.

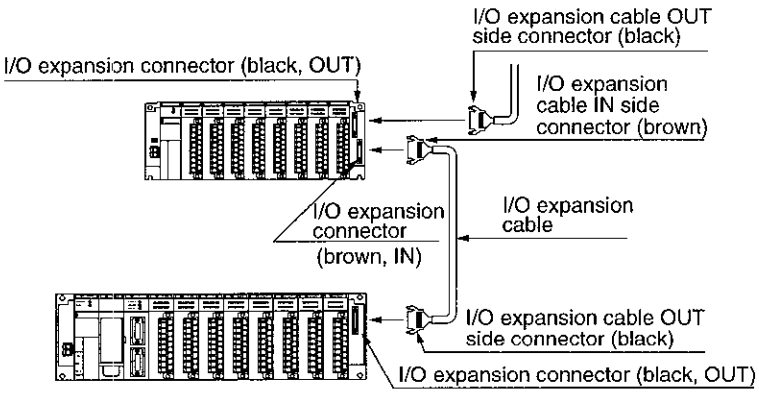
- Connect as to match the color of each connector. Connection of different colored connectors may cause I/O bus error, in which case the JW20H does not operate.





② Connect connector (blown IN side) of the No.1 expansion rack panel (rack no. setting switch is "1") with connector of the I/O expansion cable (blown, IN side), and fix to each other by lock lever.

- See page 38 "Number of expansion rack panel", for the rack no. setting switch of the expansion rack panel.



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↓

③ Connect connector (color: black, OUT side) of the No. 1 expansion rack panel (rack No. setting switch is "1") with connector of I/O expansion cable (color: black, OUT side), and fix to each other by lock lever.

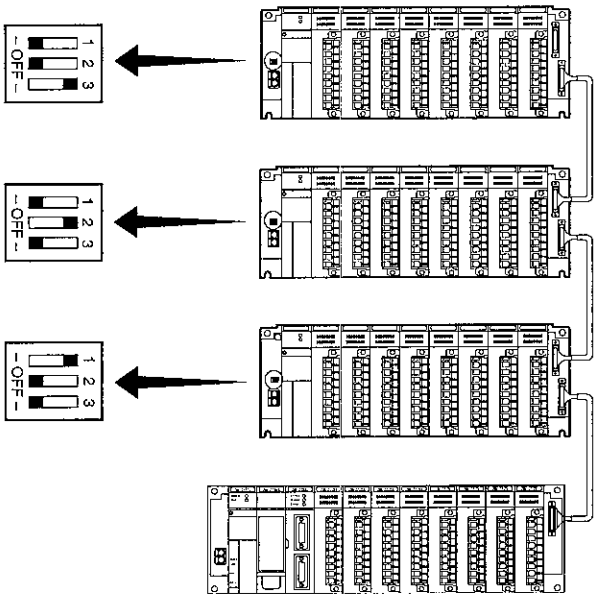
↓

④ Connect connector (color: brown, IN side) of the No. 2 expansion rack panel (rack No. setting switch is "2") with connector of I/O expansion cable (color: brown, IN side), and fix to each other by lock lever.

↓

⑤ Connect connector (color: black, OUT side) of the No. 1 expansion rack panel (rack No. setting switch is "2") with connector of I/O expansion cable (color: black, OUT side), and fix to each other by lock lever.

As mentioned above, connect the I/O expansion cables from the OUT side of the basic rack panel to the next IN side of the expansion rack panel, and from the OUT side of the expansion rack panel to the next IN side connector of the expansion rack panel.
Follow the order of rack number switches as for the sequence of connecting the I/O expansion cable to the expansion rack panel.



When using the JW-22EC/25EC/210EC with the I/O expansion cable, be sure to install a short connector (for termination resistance) in OUT side of the final expansion rack panel. Otherwise, an error may occur. When using only JW-203EC/207EC, installation of short connector is unnecessary.

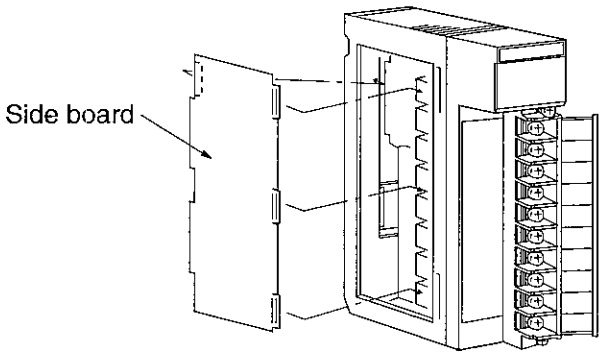
Note: When using I/O expansion cable, JW-22EC/25EC/210EC, fix the shield line (green) of the I/O expansion cable on the partition plate or the control panel together with the rack panel.

5-8. Installation of input/output module side board

The section contains instructions for installation of the input/output module side board.
The side board prevents dust from entering input/output module.
Install the side board with the left end module, when the input／output／special I/O module is installed on the expansion rack panel without power supply module. The side board is supplied with the expansion rack panel.
When the power supply module is installed on the expansion rack panel, do not install the side board. Otherwise, module cannot be installed property.
Execute the process in reverse when removing the side board.

■ Side board installation procedure

① Hang side board craw on the side of module in order to fix side board, and push side board toward module.



Chapter 6. Wiring

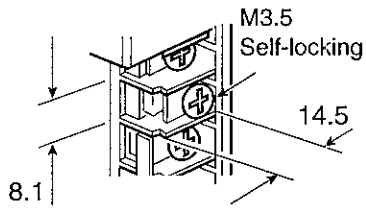
6-1 Precaution for wiring

Follow the below instructions for wiring:

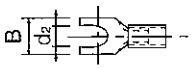
1. Separate power line and I/O lines of the JW20H from high voltage lines and power lines as far as possible. Do not run power lines and I/O lines in parallel with high voltage or power lines.
2. For the I/O expansion cable and wiring the 5 VDC cable, use supplied accessories for the I/O expansion cable.
3. Don't run the I/O expansion cable and the 5 VDC cable inside a duct.
4. Provide easy-to-detach wiring thoroughly considering operability at maintenance and repair.
5. Use twisted cables of over KIV 1.25 square for connection to the primary power input terminal of the power supply module.
6. Use cables of over KIV 0.5 square (0.18 square/32 points connector type) for wiring from the relay terminal block of the control panel to the input module. For wiring to the output module, use cables of over KIV 0.75 square for large capacity such as solenoid valves; and cables of over KIV 0.5 square (0.18 square/32 points connector type), for other usage.
7. Use wires of over KIV 1.25 square for wiring from the relay terminal block to input/output equipment.
8. When the whole factory site is grounded for high electricity and not suitable for the grounding of the JW20H, connect the GND terminal of the JW20H with just the board ground.(See next page.)
9. Use the crimp-style terminals of our recommendation for wiring to the terminal blocks of the JW20H, whenever possible.

Terminal block dimensions (mm)

• Power supply module



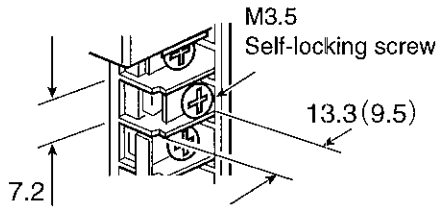
• Crimp-style terminal dimensions



Crimp-style terminals (our recommendation: Made by JAPAN SOLDERLESS TERMINAL MFG. CO., LTD)

Dimensions (mm)	Models
B<8 d2>4	1.25-YS4A V1.25-YS4A 2-YS4A V2-YS4A

• The other module (dimensions in parentheses are for the two layer terminal blocks)



■ Wiring with noise countermeasures

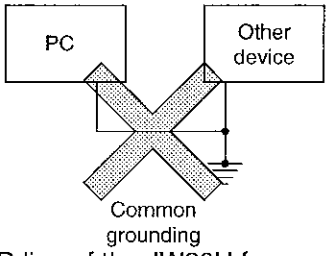
For your safe usage of the JW20H, observe the "Precaution for Wiring" of the previous page carefully. Wiring to prevent the JW20H from malfunction caused by noise is shown below. Besides, some malfunctions by noise come from complex causes or a cause which cannot be analyzed in quantity. Use the following noise countermeasures as your reference, when you take measures for each actual situation.

(1) Grounding

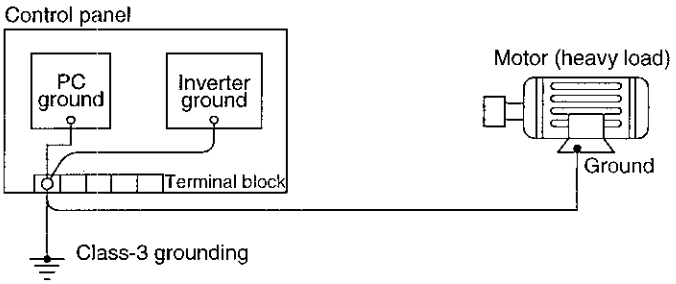
Grounding has two purposes; to protect operators from electric shock and to prevent malfunction by noise. The grounding for noise prevention is shown here.

Don't use a common ground for the JW20H and other device.

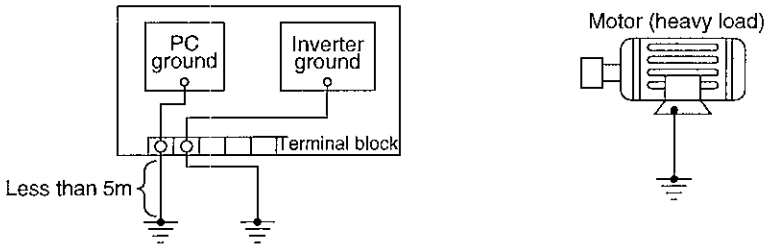
When the GND cable of the JW20H is also used for grounding for other device, noise might come into the JW20H from other device.



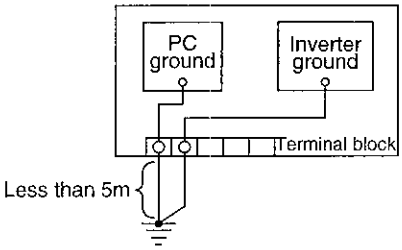
Bad example: Don't use the GND line of the JW20H for grounding of a motor or an inverter.



Countermeasure 1: Separate grounding for each of the JW20H, the motor and the inverter.



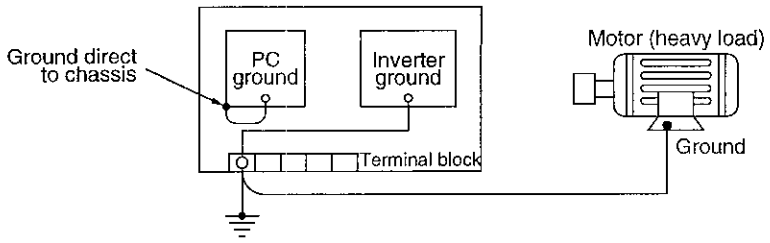
Use a twisted wire of over 2 mm^2 sectional area and less than 5 m long in grounding the JW20H for the noise prevention purpose.



When separate groundings of the motor, the inverter and the JW20H are not available, a common ground can be used, by wiring a separate wire from each piece of equipment up to the common ground.

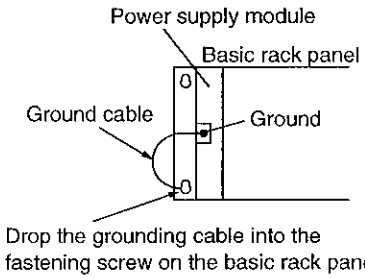
Countermeasure 2: When separate grounding is not available.

If a separate grounding for the JW20H cannot be made, ground directly from the GND terminal of the JW20H to the chassis on which the JW20H is mounted.

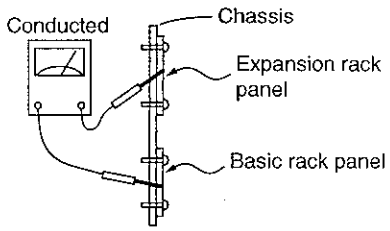


Note: Observe the following points for direct grounding of the GND cable of the JW20H to the chassis:

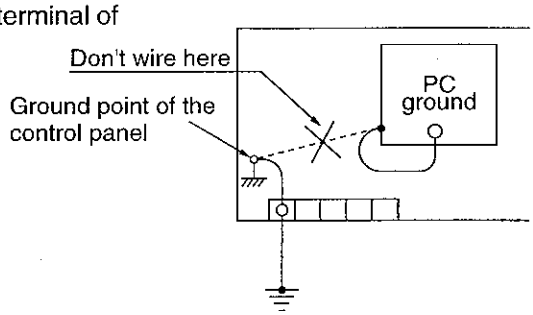
- Connect the grounding cable from the GND terminal of the power supply module of JW20H to the chassis in the minimum distance. The same wiring manner should be used for the expansion rack panel.



- Install firmly the basic rack panel and the expansion rack panel on the chassis of the control panel and make sure of the electric conductivity.



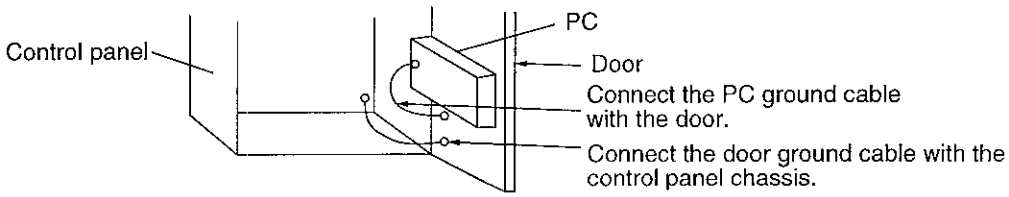
- Where the control panel itself is grounded, do not wire between the grounding point and the GND terminal of the JW20H.



Reference: Note for fitting the JW20H on the control panel door.

Ground from the GND terminal of the JW20H to the door.

Use a twisted wire of over 2 mm^2 sectional area for grounding cable of the control panel from its door (less than 50 cm.)

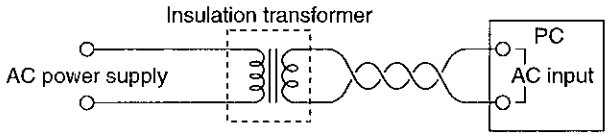


(2) Countermeasure of noise from power supply line

The AC power supply input noise resistance capacity of the JW20H is 1000 Vp-p. When any noise over this limit is possible to come through the power supply line, install an insulation transformer.

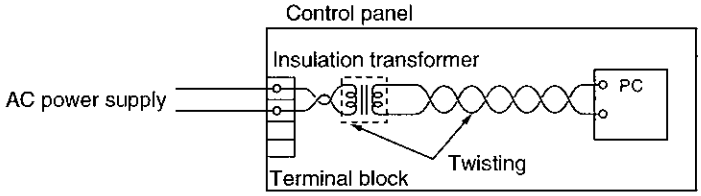
Countermeasure: Install an insulation transformer

Noise has a high frequency of 100 KHz to 2 MHz, which should be blocked by a transformer.



Note: When using an insulation transformer, note the following points:

- An insulation transformer with static electricity shield can also prevent noise by static coupling.
- Install and insulation transformer near the power supply input of the control panel in order to block noise at the entrance of the control panel.

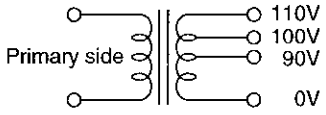


- Use two twisted wires in the primary and secondary sides of the transformer.
- Choose the insulation transformer of the capacity of more than 20% higher than that of the rated load. When a transformer of the same capacity as that of the rated load is used, a primary input voltage might exceed the transformer rated capacity and become dangerous state such as emitting smoke.

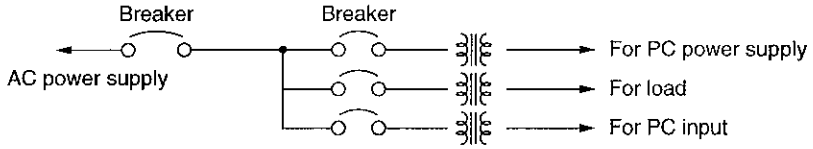
  In case of JW20H, use the insulation transformer of the capacity of more than 72 VA.

Power supply module	Power consumption	Using the capacity of transformer
JW-21PU	60 VA or less (Maximum load state of module of one power supply module 1)	72 VA or more
JW-22PU		
JW-31PU		

- When a large-capacity transformer with higher voltage in the secondary side is chosen, we recommend to install a intermediate voltage tap.

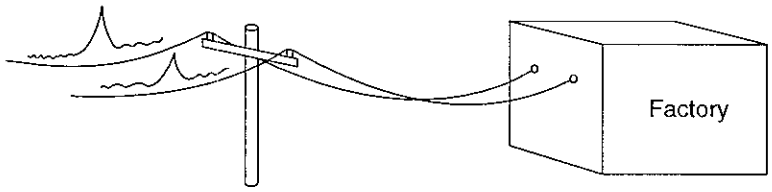


- With particularly large noise, several transformers can be installed, not only to the power supply input of the JW20H but also to the load and AC input.

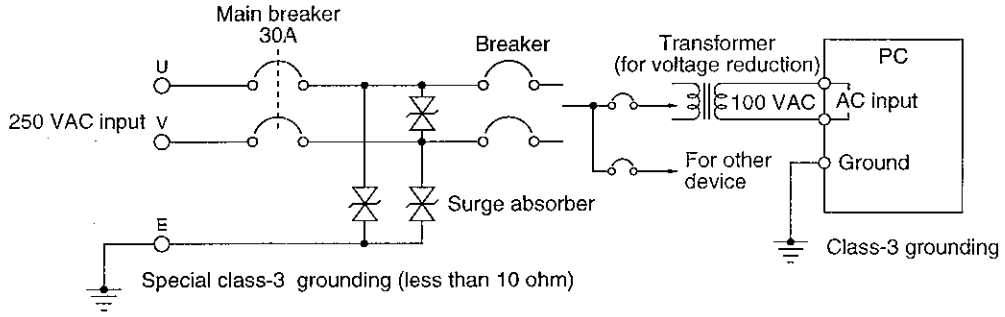


(3) Safeguard from lightning

Below are countermeasures in case when the factory facilities are located far from residential areas and that effects from induced lightning (induced voltage by lightning strikes) are expected. Note, however, that they are not the measures for direct strikes of lightning. In some cases, the voltage of the induced lightning may go beyond 4000 KV. Therefore, the purpose of these countermeasure is just to minimize the damage on the device.



Countermeasure 1: Install a surge absorber on the receiver panel of commercial electric power as protection from induced lightning.
Different models should be chosen according to the facilities load and power supply voltage. For your reference, below is a wiring diagram of the outdoor type cubicle for 1.7 KVA.



Note: Note the following when wiring.

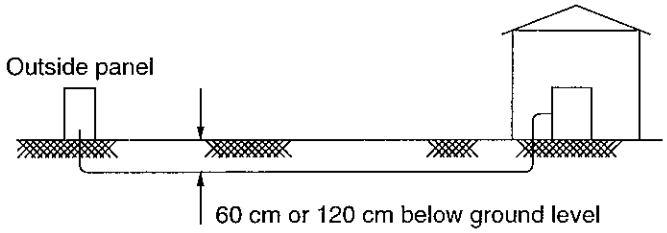
- The ground of the surge absorber is the special class-3 ground (less than 10 ohm ground resistance) and should be separated from the ground of the JW20H. (Class-3 grounding.)
- Install the main breaker before the surge absorber.
- The followings are known surge absorbers in the market. Different types for different power supply voltages.

Commercial power voltage	Model name	Specifications	Manufacturer
100 VAC	ERZ-A20PK251	Varistor voltage: 250V ± 10% Surge resistant volume: 1,500A (8 × 20μs) Energy resistant volume: 15 Joule	Matsushita Electric Co.,Ltd.
200 VAC	ERZ-A20PK501	Varistor voltage: 500V ± 10% Surge resistant volume: 1,500A (8 × 20μs) Energy resistant volume: 70 Joule	

- Use the ground wire of over 3.5mm^2 section area for the surge absorber.

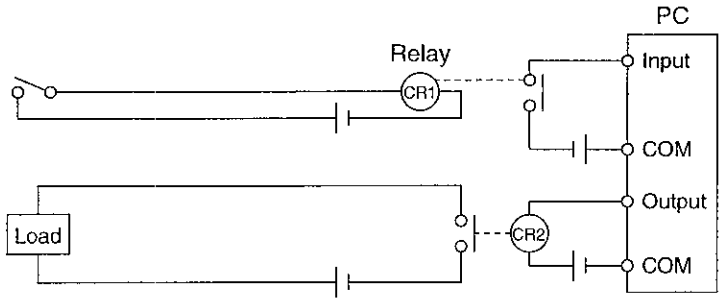
Countermeasure 2: Underground wiring as a countermeasure of lightning.
When communication cables and input cables of the JW20H go out of a building, place them underground. Provide junction for input/output signals using relays.

1. Underground cabling
   In a lightning weather condition, the atmosphere is electrically charged and a wiring in the air induces a voltage of over 24 VDC. Therefore, place the wiring under the ground.



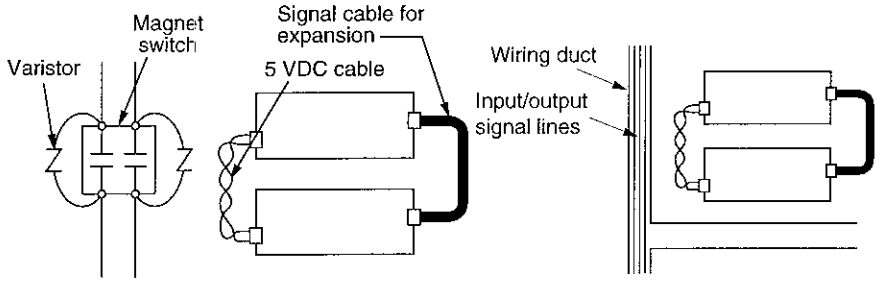
   As for the depth of cable installation, refer to local regulations.

2. Relay connection for the input/output signals using relays.
   The relay isolates the effects of lightning and minimizes the damage.



(4) Wire of signal cable for expansion

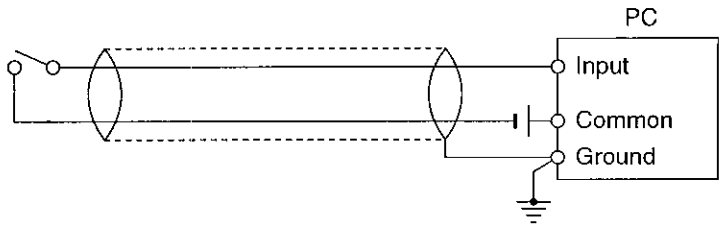
When turning ON/OFF of the magnet switch installed near the JW20H and the signal cable for system expansion, high noise and high voltage may occur to give bad effects on the operation of the JW20H. Therefore, for prevention of the noise occurrence, insert a noise killer, such as a varistor, at the contact point of the magnet switch. Do not place the signal cable for expansion and the 5 VDC cable inside the duct, through which input/output signal lines and power lines are running.



(5) Note for external wiring to I/O module

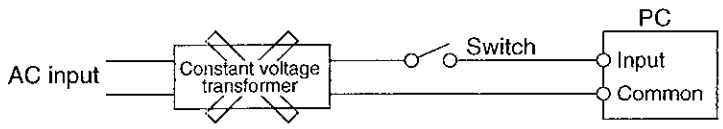
1. Relay output module: JW-204S/JW-214S
   Since the relay output module does not have a built-in surge absorbing circuit, do not forget to install a surge killer, such as a varistor, in the output side. Operation without a surge killer might give bad effects on other modules by spark noises from the relay. As for the surge killer, see 6-2 [4] "Cautions for using I/O Module."

2. DC input module: JW-202N/JW-212N/JW-214N/JW-234N
   When extending the external line of the DC input module for more than 100 m, use shielding wire. Even in case of less than 100 m extension, shielding wires should be used under certain conditions. Do not forget to connect the shield of the shielding wire with the ground of the JW20H.



Note 1: Connect the shield ground on JW20H's connected side only or both of JW20H's and its connected sides, depending on actual conditions.

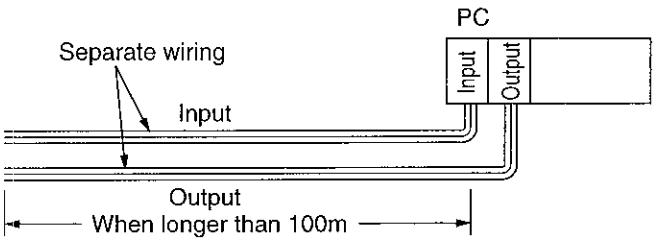
3. AC input module: JW-201N/JW-211N/JW-203N
   Do not use the outputs from a constant voltage transformer and an AC regulator, for the AC power supply to the AC input module. When the constant voltage transformer and the AC regulator are used, the module signal could be turned ON even with an input voltage less than the rate voltage due to a high distortion rate (10 to 50%) of alternative current waves.
   The power supply to the AC input module should have a distortion rate of less than 5%.



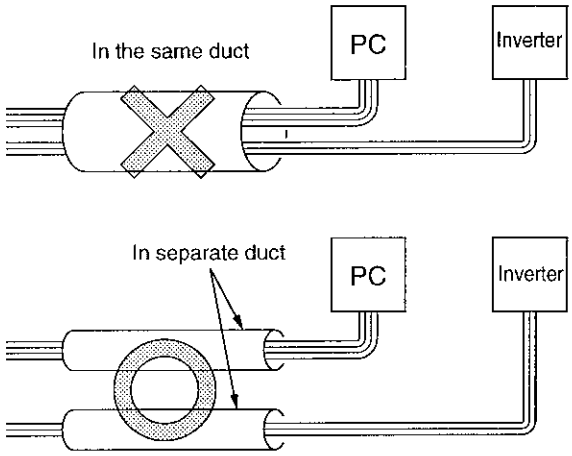
4. Wiring with power line

   Do not run the input signal, output signal and communication cables of the JW20H near and in parallel with the power line.

   - When input and output signal cables are extended over 100 m, make separate wiring for the input signal and the output signal of JW20H.



   - Make separate wiring for the input signal and the output signal of the JW20H from the power line. Particularly with the power line for the inverter and the servo driver, do not place signal wires inside the same duct or pipe with the power line, even if they are less than 10 m.



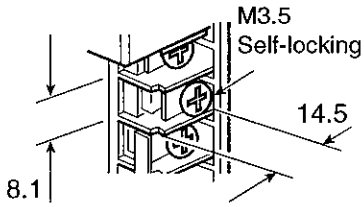
6-2 Wiring for each module

The following describes external wiring for the power supply module, the control module, the I/O module and the expansion rack panel.

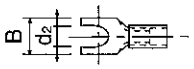
[1] Power supply module: JW-21PU/31PU (AC power supply module)

Before wiring, confirm position and state of installation and model number of the power supply module. For wiring, use a twisted wire of over KIV1.25 square and crimp-style terminals.
In order to prevent wire wastes from dropping into the module through a ventilation hole of the module during the wiring work, keep the caution label stuck onto the upper side of the module. Peel the caution label off of the module when all wiring work is finished.

• Power supply terminal block dimension (mm)

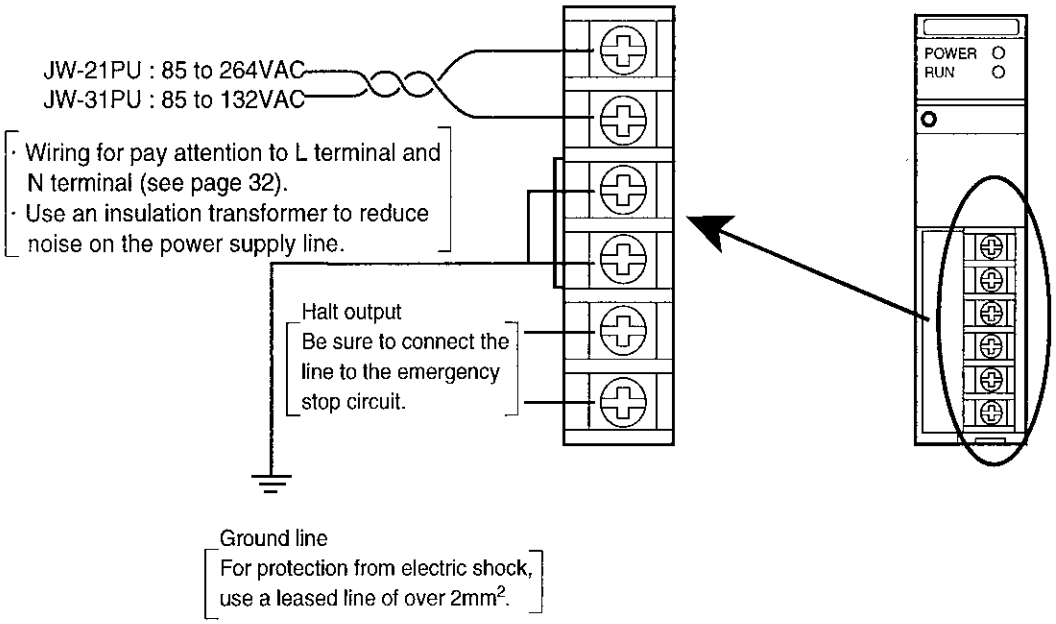


• Crimp-style terminal dimensions



Crimp-style terminals (our recommendation: Made by JAPAN SOLDERLESS TERMINAL MFG. CO., LTD)

Dimensions (mm)	Models
B<8 d2>4	1.25-YS4A 2-YS4A V1.25-YS4A V2-YS4A



When DC output module: JW-202S/212S/232S/232M is used as an output module, connect the AC relay with the halt output and prepare the contract point in the emergency halt circuit.
Fasten the screw on the terminal block with a torque of less than 12 Kgf • cm.
The halt output on the power supply module that is mounted on the basic rack panel and expansion tack panel should be connected to an external operation ready circuit in direct.
Take OFF a cover on the terminal block when wiring, and put the cover back on the block when wiring work is finished.

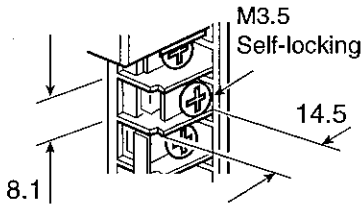
In the case where the power supply module is installed on the expansion rack panel for operating the JW20H, use one power supply system for both power supply module on the basic rack panel and the expansion rack panel. If each power supply is wired from a different system, the JW20H does not run when either one is switched OFF.
After the cabling work for the power supply module, reconfirm the state of wiring and installation.

[2] Power supply module: JW-22PU (DC power supply module)

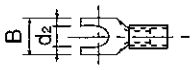
Before wiring, confirm position and state of installation and model number of the power supply module. For wiring, use a twisted wire of over KIV1.25 square and crimp-style terminals.

In order to prevent wire wastes from dropping into the module through a ventilation hole of the module during the wiring work, keep the caution label stuck onto the upper side of the module. Peel the caution label off of the module when all wiring work is finished.

• Power supply terminal block dimension (mm)

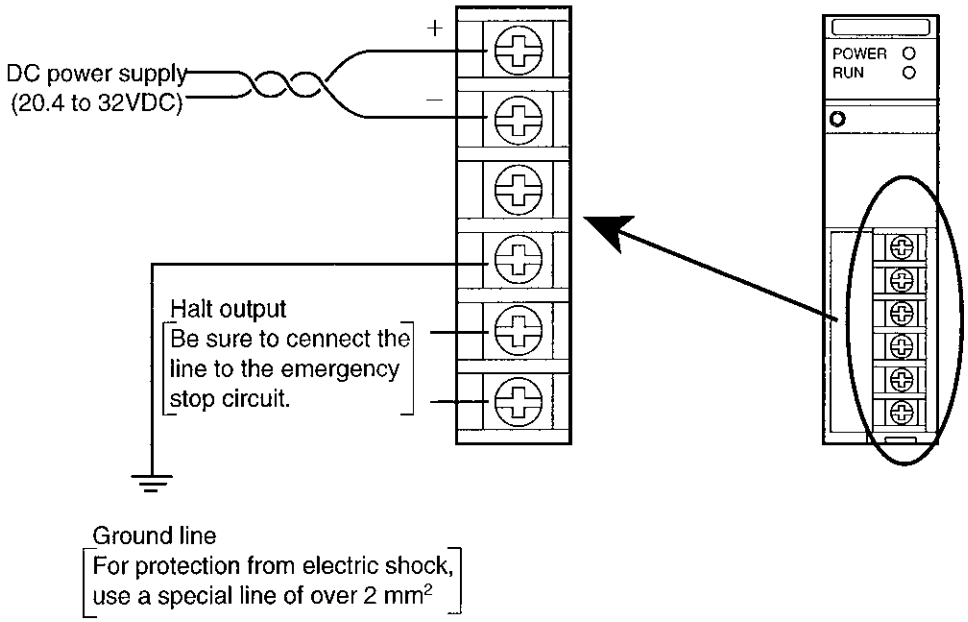


• Crimp-style terminal dimensions



Crimp-style terminals (our recommendation: Made by JAPAN SOLDERLESS TERMINAL MFG. CO., LTD)

Dimensions (mm)	Models
B<8 d2>4	1.25-YS4A 2-YS4A V1.25-YS4A V2-YS4A



Ensure correct connection for polarity of the input power supply. Mis-connection of the polarity will destroy the module when power is supplied.

Fasten the screw on the terminal block with a torque of less than 12 Kgf • cm.

Take OFF a cover on the terminal block when wiring, and put the cover back on the block when wiring work is finished.

In the case where the power supply module is installed on the expansion rack panel for operating the JW20H, use one power supply system for both power supply module on the basic rack panel and the expansion rack panel. If each power supply is wired from a different system, the JW20H does not run when either one is switched OFF.

After the cabling work for the power supply module, reconfirm the state of wiring and installation.

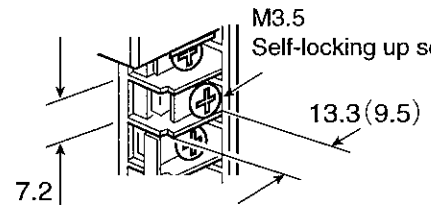
[3] I/O modules

Before wiring to the I/O modules confirm the state of installation, model number and specifications of the module. Special attention should be paid to the specifications. If the module is used under the conditions beyond its rated specifications, the module might be damaged, destroyed or cause fire.

When wiring from the relay terminal block of the control panel to the I/O module, use a twisted wire of over KIV 0.5 square (over KIV 0.5 square in case of wiring to the output module of large capacity, such as solenoid valves) and crimp-style terminals. For the common line, use bigger wires than the above.

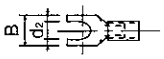
In order to prevent wire wastes from dropping into the module through a ventilation hole of the module during the wiring work, keep the caution label stuck onto the upper side of the module. Tear OFF the label when all wiring work is finished.

• Terminal block dimension (mm)



(Dimension in parentheses two layer terminal blocks)

• Crimp-style terminal dimensions



Crimp-style terminals (our recommendation: Made by JAPAN SOLDERLESS TERMINAL MFG. CO., LTD)

Dimensions (mm)	Models
B<7.2 d_2>4	1.25-YS4A 2-YS4A V1.25-YS4A V2-YS4A

Take maintenance work convenience into consideration, when wiring.

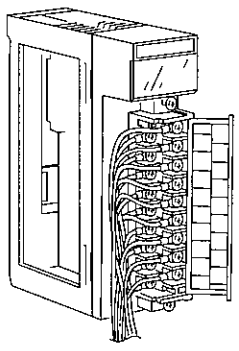
Do not include the input/output lines in the same pipe or duct as high-voltage line and power line. It might cause malfunction or damage to the module.

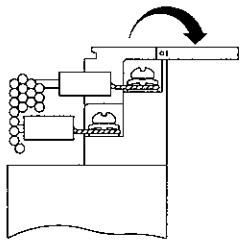
Avoid wiring over the operation indicator (LED indication area) of the module.

(1) Terminal block type of 8/16 points

Open the terminal cover when wiring.

After the wiring word, close the cover and install a module cover : JW-20CV (optional), wherever possible.





Ensure correct connection for polarity of the input power supply. Mis-connection of the polarity will destroy the module when power is supplied.

Fasten the screw on the terminal block with a torque of less than 12 Kgf • cm.

After the cabling work for the power supply module, reconfirm the state of wiring and installation.

(2) Connector type of 32/64 points

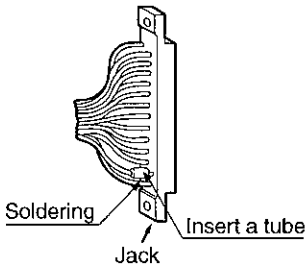
・Assembly of the connector

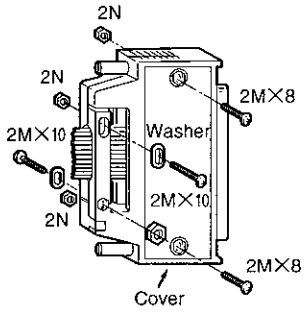
Note that the terminal numbers of the connector are not identical with address numbers.

① Insert insulation tube into signal line.

② Solder signal line to connector terminal. Confirm the connector terminal and its address number, before soldering.

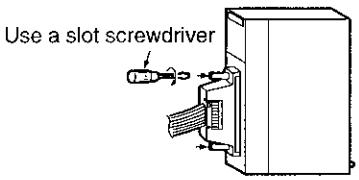
③ Assemble connector. Assembly parts (screws, washers and nuts) are attached to the connector.





Use the following recommended cable for the signal line.
Recommended cable: Multiple vinyl insulation vinyl sheath cable
18P × 0.18 57VV-SB (made by FUJIKURA LTD.)

・Connection with the module

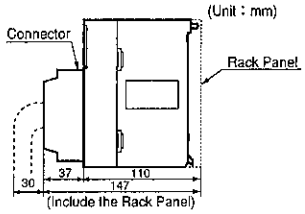


Ensure correct connection for polarity of the input power supply. Mis-connection of the polarity will destroy the module when the power is supplied.
Attached connector of 32/64 points I/O module is soldering type, and available for connector of pressure welding/climp-style.

Wiring	Model name	Manufacturer	Recommended wiring size	Remarks
Pressure welding	FCN-367J040-AU/F (Connector)	FUJITSU CO., LTD	Flat cable 1.27 mm pitch AWG28 (twisted wire) AWG30 (single wire)	Recommended our climp-style of tool made by FUJITSU CO., LTD.*
Climp-style	FCN-360O040-B (Connector cover) FCN-363J040 (Housing) FCN-363J-AU (Contact)		AWG24 to AWG28 Strip outer of cable is Ø1.2 or less	
Soldering	FCN-360O040-B (Connector cover) FCN-361J040-AU (Connector)		AWG23, 24 (0.26 to 0.20 mm^2)	Accessories

* Hand press: FCN-707T-T101/H Cable cutter: FCN-707T-T001/H
Locator plate: FCN-367T-T012/H

・Outline dimensions drawings of JW-234N/232S/232M, JW-264N/262S



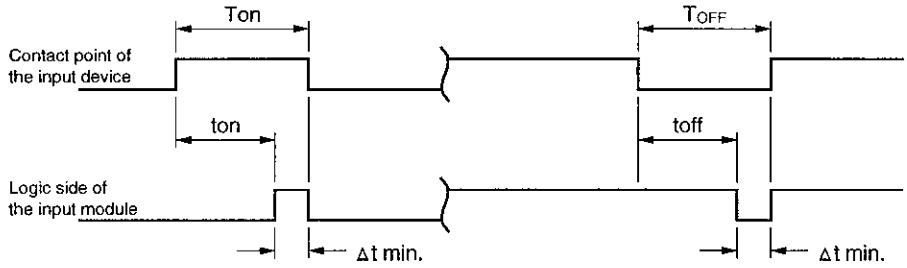
[4] Precaution for operating I/O modules

(1) Precautions for operating input module

1. ON/OFF time of the input signal

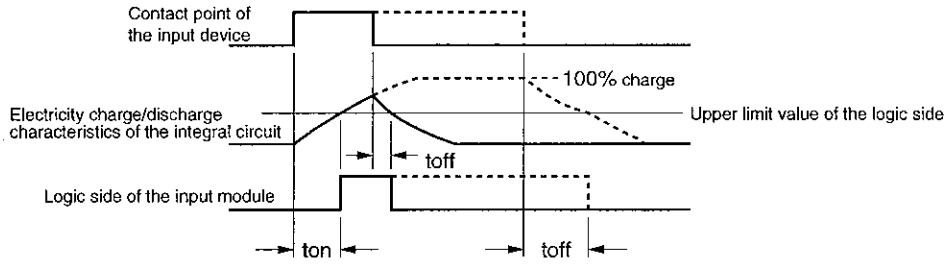
In order to ensure ON/OFF condition of the input device correctly (limit switch etc.) on the operation of the JW20H, ON or OFF time should meet the following conditions.

ON time of the input device (T_{ON})	$T_{on} > \Delta t + t_{on}$
OFF time of the input device (T_{OFF})	$T_{off} > \Delta t + t_{off}$
	Δt ···· One scanning time of PC
	t_{on} ···· OFF to ON response time of the input module
	t_{off} ···· ON to OFF response time of the input module



In the input/output process at the beginning of each scanning cycle, ON/OFF state of the logic side of the input module is written in the data memory and used as input data for operation of the user's program within its scanning cycle. Therefore, if ON or OFF time of the logic side of the input module is less than one scanning time (Δt), ON/OFF data may not be included in the data memory.

Note: The response time of the input module is made by the electricity charge/discharge characteristics of the integral circuit of the input module, and it varies depending on the time of duration of ON or OFF.



toff shows the difference, shown in the above, between the case when the ON time of the contact point of the input device is longer as shown by dotted lines and the case when the ON time is shorter as shown by solid line.

(Calculation example in case the JW-214N is used as an input module)

If one scanning time is 5ms,

$T_{on} > \Delta t + t_{on} = 5 + 0.5 = 5.5$ (ms)

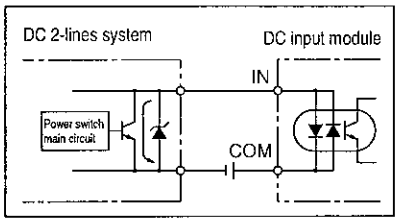
$T_{off} > \Delta t + t_{off} = 5 + 1.5 = 6.5$ (ms)

2. Connectable input device

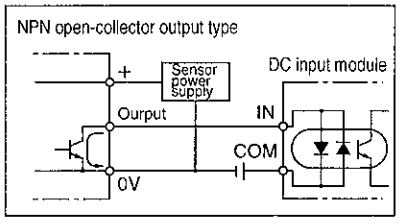
The followings are sensors and switches which can be connected as input. See below for selection and connection of the input device.

- **DC input device**

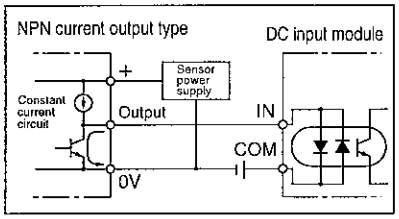
①



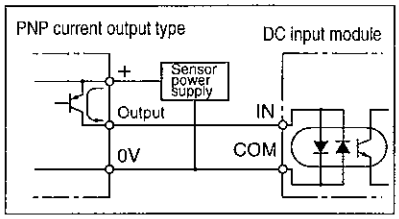
②



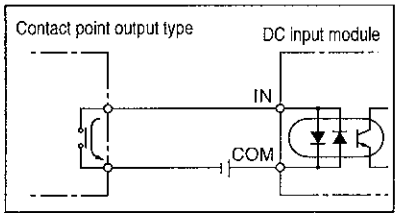
③



④

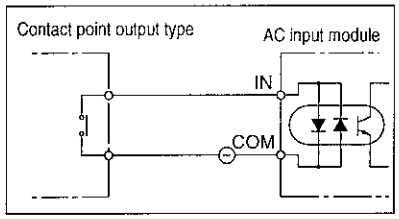


⑤

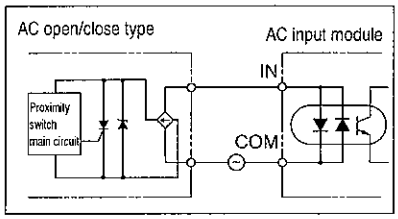


- **AC input device**

⑥



⑦

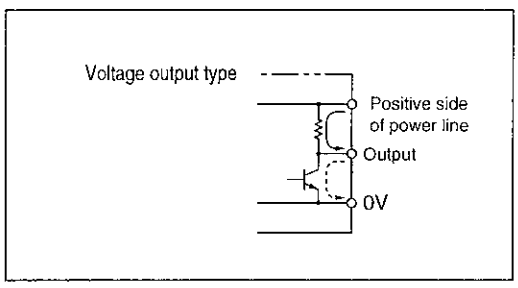


In cases of ①, ②, ③, ④, and ⑤, use a transistor having current driving capacity larger than that of the constant input current of the DC input module.

④ can be used only in case of the DC input module without common polarity characteristics.

In cases of ① and ⑦, pay attention to leakage current at OFF. (When leakage current is higher than the OFF input current level of the input module, the proximity switch may not turn OFF.)

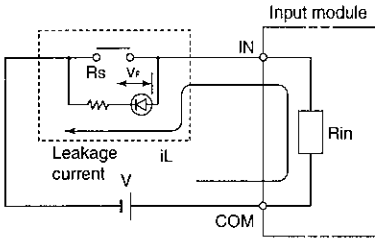
Be careful that voltage output type DC inout device shown in the right may not be connected. (Driving capacity of an output transistor should be higher than the ON level of the input module).



3. Countermeasure for leakage current on input device

In the following device, there is also leakage current at OFF. If the leakage current is higher than the OFF level of the input module, the input module may not turn OFF, or noise margin at OFF state may drop.

a. Limit switch with LED



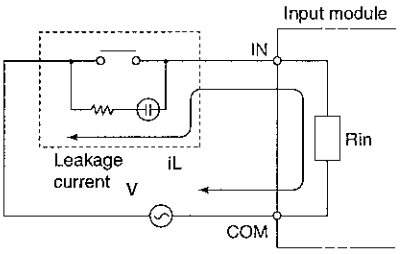
Reference

Calculation of leakage current i_L

$$i_L = \frac{V - V_F}{R_S + R_{in}}$$

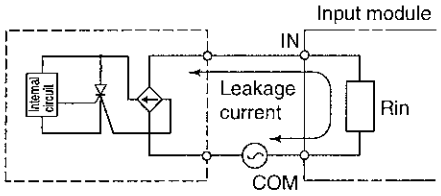
V: Power supply voltage
V_F: Voltage drop in the forward direction of LED
R_S: Current limit resistance
R_{in}: Input impedance of input module

b. Limit switch with neon lamp (the neon lamp is connected in parallel with the contact point.)



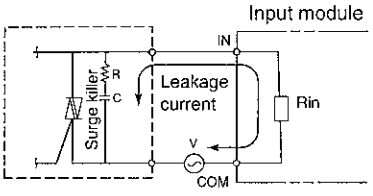
c. Proximity and photo switches of AC two lines system

In the AC two lines system, even at OFF there is leakage current from current consumption of the internal circuit, and this might prevent the input module from falling in the OFF state. This is nominated as "leakage current" in the specifications of photo switches etc. Make sure that this value is less than the OFF level of the input module.



d. Built-in triac, thyrister and contact point output of surge killers

Some device has CR device as a surge killer for the purpose of avoiding the check mistakes of triac and thyrister, and the leakage current of this CR may prevent the input module from falling in the OFF state. In such a case, the best remedy is to remove the CR. If this is not possible, use the C value of the CR of less than 0.033 μF for 100 VAC; and that of less than 0.015 μF, for 200 VAC.



Reference

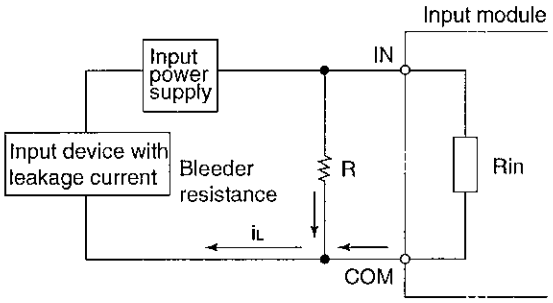
Calculation of leakage current i_L

$$i_L = \frac{V}{2\pi fc}$$

V: Power supply voltage
f: Power frequency (50/60Hz)
C: Capacitor

Countermeasure: Connection of bleeder resistance

As a countermeasure, a bleeder resistance can be inserted in the input side of the input module as shown below.



Choose the bleeder resistance value R to meet the following conditions:

$$i_L = \left(\frac{R_{in} \times R}{R_{in} + R}\right) < V_{in\ OFF}$$

Composite impedance of the bleeder resistance and the input impedance

$$R < \left(\frac{V_{in\ OFF} \times R_{in}}{R_{in} \times i_L - V_{in\ OFF}}\right) \times \underset{\sim}{0.5}$$

Margin

i_L: Current leakage of the input device
$V_{in\ OFF}$: Input of the input module OFF level voltage
R_{in}: Input impedance of the input module
V: Input power supply voltage

In this case, the rating electric power W is,

$$W > \frac{V^2}{R} \times \underset{\sim}{3}$$

Margin

[Example] In case that the JW-212N is used as an input module at the input power supply voltage of 24 V, and that the leakage current of the input device is 5 mA,

$i_L = 5$ mA
$V_{in\ OFF} = 5$ V
$R_{in} = 3.3$ k ohm
$V = 24$ V

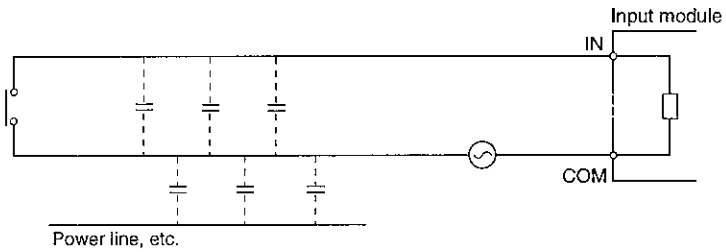
$$R < \frac{5 \times 3.3}{3.3 \times 5 - 5} \times 0.5 = 0.78 \text{ k ohm}$$

If R is 0.78 k ohm,

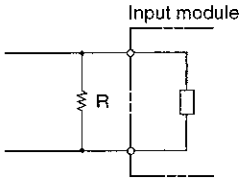
$$W > \frac{24^2}{0.78 \times 10^3} \times 3 = 2.22 \text{ W}$$

W will be 2.3 W.

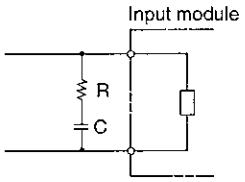
4. Notes for long-distance wiring and by-pass wiring
   In the AC input module, when the cables to external device are very long or wiring along with power lines is made, the input module might be turned ON in spite of the OFF command in the input device, due to leakage current and inducement by floating capacity among cables.



Countermeasure 1: Connect a bleeder resistance and a CR surge killer in parallel with the input module to reduce the composite impedance of the input module.



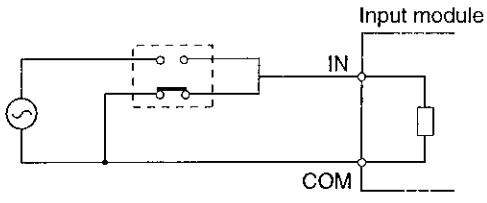
The smaller the R value, the more effective. However, when R becomes small, power consumption ($\frac{V^2}{R}$) increases. Therefore, note the R's watt value.



C: 0.033 to 0.33μF
(Pressure resistance of over 250 VAC)
R: 47 to 120 ohm

Countermeasure 2: Change the input power supply to DC (use DC input module).
In general, the direct current signals are little affected by floating capacity and inducement.

Countermeasure 3: Close circuit by making use of the b contact.
When the b contact is used to make a close circuit at OFF, very little induced voltage is generated.

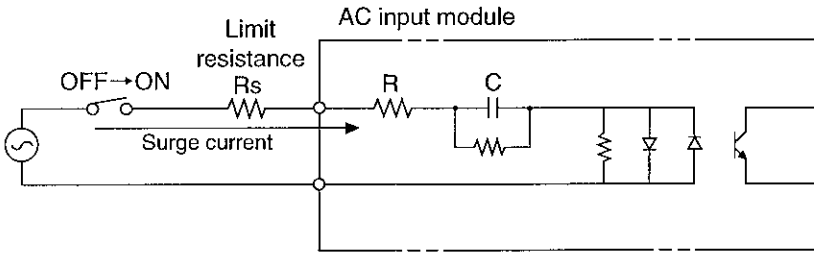


Note: Do not wire the input signal line near and in parallel with power lines of a motor and an inverter.

5. Surge current of the AC input module

There is surge current in the AC input module: JW-201N/211N/203N, when turning ON the input. The surge current of the AC input module is determined by constants (R, C) of the input circuit inside the module, power supply voltage at ON input, phase, power supply current capacity and wiring impedance. The surge current stated in the AC input module specifications is the worst value for the case of the ON input at the maximum impressed voltage and at the peak phase.

If, in certain input device, contact points are affected (adhered etc.) by the surge current, the surge current should be reduced by connecting a limit resistance Rs outside the module as shown below.



The following limit resistances Rs can be connected outside the module:

For 100 VAC input module, less than 2 k ohm (over 2 W rate electricity)

For 200 VAC input module, less than 4 k ohm (over 2 W rate electricity)

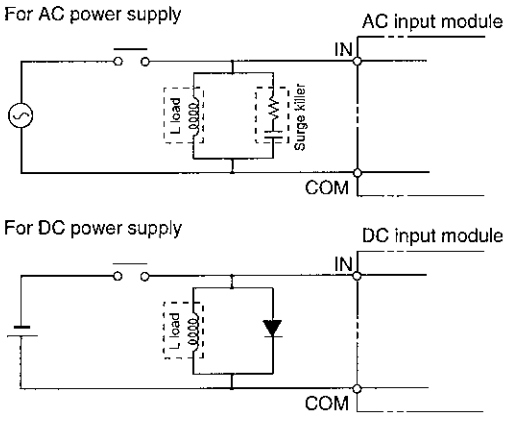
Reference

- When a limit resistance of 2 k ohm (or 4 k ohm) is connected for the 100 VAC (or 200 VAC) input module, the surge current becomes less than 80 mA at the peak ON.

Note: If a resistance bigger than the above value is connected, the input ON/OFF levels and the response times cannot be guaranteed.

6. Countermeasure in case of connection of induced load to input signal

If the induced load is connected to the input signal, in order to absorb the noise, connect a surge killer near the load for the AC circuit; and a diode, for the DC circuit, as shown below.

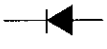


Surge killer: R, C 

C: 0.033 to 0.33 μF

(Resistance voltage of over 250 VAC)

R: 47 to 120 ohm

Diode: 

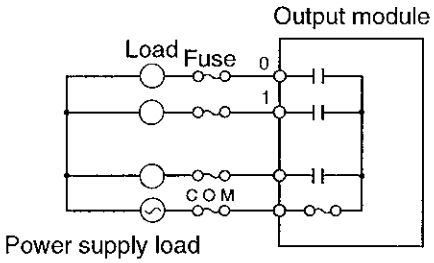
Peak inverse voltage (V_{RM}) should be more than 3 times bigger than the load voltage, and the average rectification current should be bigger than load current.

(2) Precautions for operating the output module

1. Protection from output short circuit

   In case of a short circuit of the load connected to an output terminal, output devices and print board may be burned. Be sure to insert a protection fuse in the output.

   Some modules have a built-in fuse per common line for protection of the module from heating and burning due to excessive current. It is not intended, however, for protection of the output devices and load from excessive current; therefore, insert fuse for each line outside the module. This is also advisable from maintenance point of view.

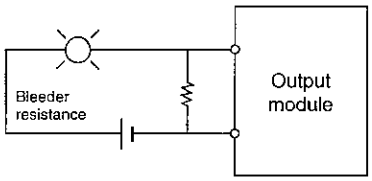


2. Countermeasure to surge current of lamp load

   At turning ON an incandescent lamp, there is surge current 10 to 20 times bigger than normal current for several 10ms. For reduction of the surge current, insert either a bleeder resistance or an electric current limit resistance.

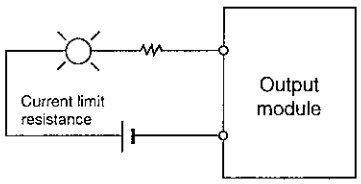
   ① To insert a bleeder resistance

   During the OFF state of the output module, keep supplying dark current so small as to turn ON the lamp dimly.



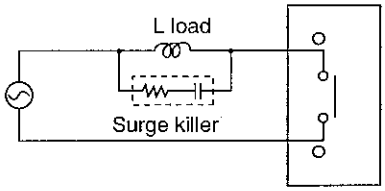
   ② To insert an electric current limit resistance

   This limits the current within a value determined by the value of the current limit resistance. When the resistance value is high, the voltage on the lamp decreases. Determine the resistance value by the brightness needed when turning ON the lamp.

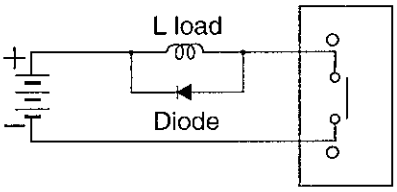


3. Countermeasure to surge voltage at opening/closing induced load
   Some load generates surge voltage of several thousands volt when an induced load is opened or closed its circuit. All output module except the relay output module have a circuit to absorb surge within module. However, when the wiring to the load is long, its effectiveness is reduced and a surge countermeasure is required in the load side as well. In case of the relay output module without surge absorption circuit, surge countermeasure outside the module is indispensable in case the load generates high voltage. (This surge voltage countermeasure can extend the life time of the contact points of the relay.)

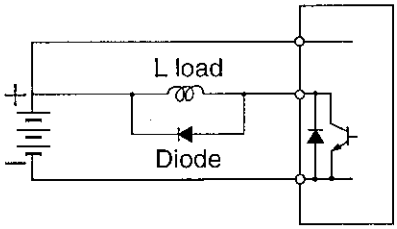
Surge voltage countermeasure



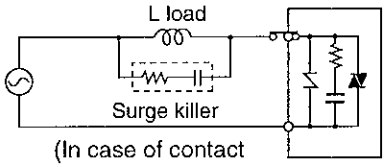
Relay output module



Relay contact point output module



Transistor output module, FET output module



(In case of contact points in series line)

Triac output module

CR surge killer: 

C: 0.033 to 0.33 μF (Pressure resistance of over 250 VAC)
R: 47 to 120 ohm

Example of CR surge killer

For 100 VAC	953M2503 10411(0.1 μ + 120 ohm) (made by Matsuo Electric Co., Ltd.)
For 200 VAC	953M5003 33311(0.033 μ + 120 ohm) (made by Matsuo Electric Co.,Ltd.)

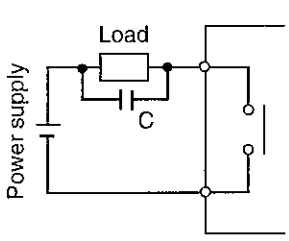
Diode: 

Peak inverse voltage (V_{RM}) is more than three times of the load voltage.
Average rectified current (Io) is more than load current.

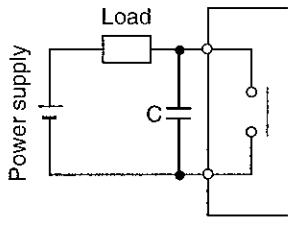
In case of AC load, a varistor can be used in place of the CR surge killer for the same effect. (Installation of both of the CR surge killer and the varistor increases the effect.)

For 85 to 132 VAC	TNR12G221K (made by Marcon Co., Ltd.), NV220D14 (made by NEC)
For 170 to 264 VAC	TNR12G431K (made by Marcon Co., Ltd.), NV430D14 (made by NEC)

Note 1: Avoid the use of a capacitor only as an arc killer, as shown below:

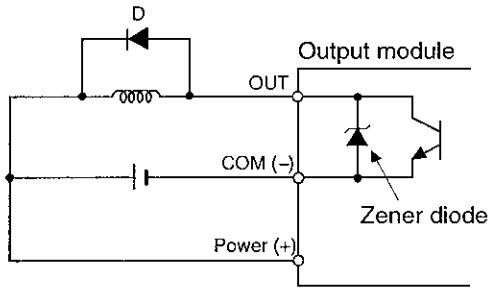


Though a capacitor is very effective for the arc deletion at shut-off. But charged current to the capacitor may melt the contact point at turning ON a contact point.



Though a capacitor is very effective for the arc deletion at shut-off. But at the opening of the circuit of a contact point, electricity is accumulated at the capacitor. Therefore, the short circuit current of the capacitor may melt the contact point at turning ON the contact.

Note 2: DC output module JW-202S uses a zener diode as a surge absorber within the module. In case of using an induced load of large load current such as solenoid valves, note the followings:



D: Diode for counter surge voltage absorption at OFF

When the load current is an induced load of over 0.3 A, use the module with the open/close frequency at less than 30 times/min. (1 sec. ON/1 sec. OFF or so). When more frequent opening/closing, a surge countermeasure for counter voltage absorption is needed in the load side. When the load current is an induced load of over 0.5 A, a surge countermeasure for counter surge voltage absorption is indispensable in the load side.

4. Load which can be driven by the AC output module

The AC output module with SSR as an output device JW-203S/213S can drive directly the loads of electro-magnetic switches, solenoid valves and lamps. In such cases note the surge current at turning ON (from OFF to ON) and the maintenance current during the maintenance state (ON state). Concretely, use the module within the following range:

Model	Range of Load Voltage	At turning ON	During maintenance state	
		Repeated allowable surge current	Minimum action current	Maximum rated load current
JW-203S	15 to 250 VAC	8A (100 ms)	30 mA	1A/point, 4A/common
JW-213S		6A (100 ms)	10 mA	0.3A/point, 2A/common

When the AC output module drives the load, note the surge current at turning ON and the holding current during the maintenance state. Keep the surge current below the repeated allowed surge current at the turning ON; and keep the maintenance current, over the minimum action current and below the maximum rated load current during the maintenance state.

The repeated allowable surge current is a value in case of the pulse width below 100 ms and repeated switching frequency below 20 times/minute. When, in case of the load of a motor, the pulse width of the surge current is large and that the switching frequency is high, keep the ON time of 1 pulse below 50%.

(When the repeated surge current is below the maximum rated load current, there is no limit in the pulse width or in the switching frequency.)

When many loads with big surge current are driven within a same common line circuit, make the number of points which turn from OFF to ON at the same time minimum. When a strong surge current goes through a built-in fuse in a common unit, the built-in fuse may be damaged or fused. The number of the surge current per common which can be turned from OFF to ON at the same time is determined by a fusing property of the built-in fuse as follows (as a guidance):

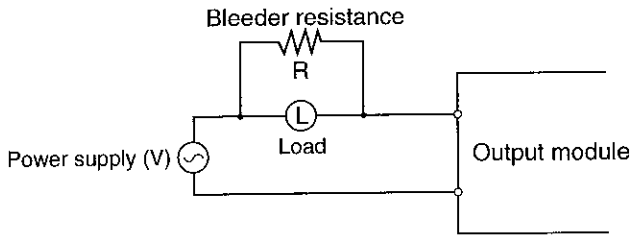
15A (50ms) or less/JW-203S, 10A (100ms) or less/JW-213S

10A (50ms) or less/JW-203S, 7A (100ms) or less/JW-213S

The numbers in ( ) are pulse widths.

For a light load of the holding current which is smaller than the minimum action current, some characteristics of load may prevent turning OFF. In such a case, connect a bleeder resistance in parallel with the load to increase the maintenance current up to the minimum action current or more.

Some electro-magnetic switches of the pulse-driven cannot be turned OFF even if the holding current is over the minimum action current. In such a case, also, connect a bleeder resistance in parallel with the load. (Select a value of the bleeder resistance so that it can allow the minimum action current by itself.)



Calculate the value R of the bleeder resistance in the following formula:

$$R < \frac{V}{I}$$

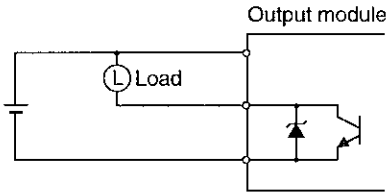
V: Power supply voltage
I: Minimum action current of the output module

Then, the capacity of R (W) is

$$W > \frac{V^2}{R} \times \underset{\sim}{3}$$

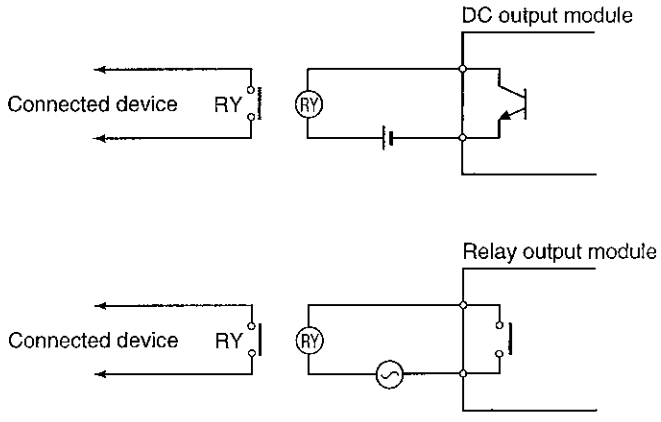
Margin

5. OFF delay time when the DC output module drives the induced load
When the DC output module with a built-in cramp diode is used as a surge killer to drive the induced load of direct current such as electro-magnetic valves and solenoid valves, it may be impossible to complete high-speed switching due to the delay of response, since electric current goes to the load through the cramp diode. In such a case, the DC output module with a built-in zener diode, instead of the cramp diode, could speed up the response.



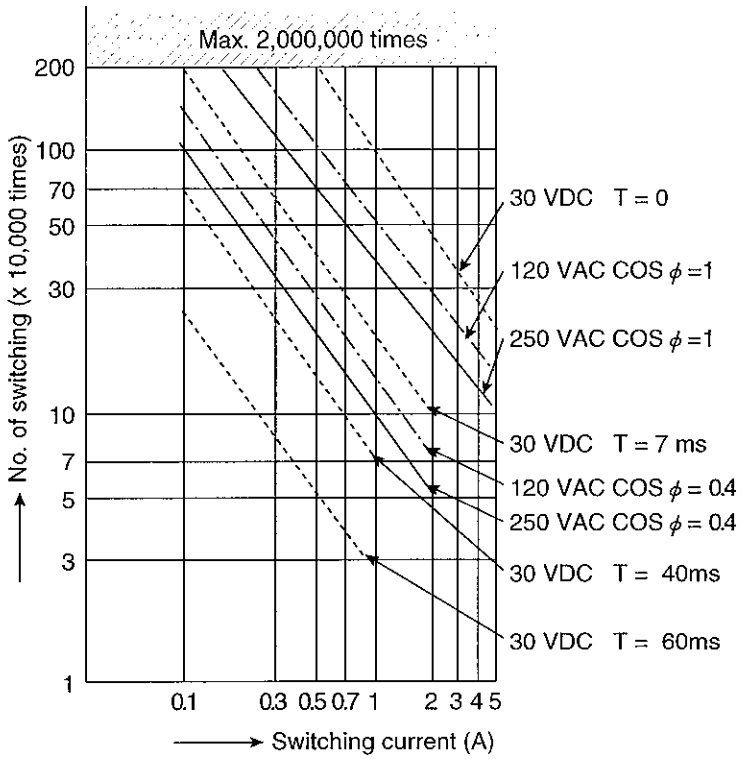
DC output module with a built-in zener diode
JW-202S
JW-212S

6. When miniature load is driven by a relay output
The relay used in the relay output module is suitable for power drive, and so with a low voltage and small current such as 24 VDC and 10mA, the contact reliability of the contact point drops. In such a case, we recommend to use a DC output module (transistor output). When connection with a low voltage and small current contact point output cannot be avoided, the following connection should be made: A miniature relay with a reliable contact point under low voltage and small current is driven, and the contact is made at that contact point.



7. Life of relays of the relay output module

The relay's life of the module (JW-204S/214S), which uses a relay in output circuit, varies depending on the kind of loads (difference of the power rate of the signal on the contact point is AC or DC and its current value). The following shows characteristic curves of the relay contact point.



Note 1: The above chart shows standard values.
Depending on the environment of usage (ambient temperature and humidity), different life may result.

Note 2: When the signal to the contact point is DC, the life of relays varies according to the load rise characteristics (time constant: T) of the load. The load rise characteristics of the load after the contact point is turned ON are determined by inductance: L and resistance: R

$$\left(T = \frac{R}{L} \right)$$

For the time constant of the load used, see below:

In case of resistance load: T < 1ms

In case of small size relay: T = 7 ms

In case of large current L load and magnet: T = 40ms

In case of the L load with a diode for surge countermeasure, the life of relays may be similar to the case of T < 1ms.

Note 3: Use the relay output module, with the contact switching life of more than 100,000 times and within the current capacity of less than 2A.

[5] Wiring to basic/expansion rack panel

There are 3 different models for each of the basic and expansion rack panels (in total 6 kinds).

Basic rack panels	Expansion rack panels
JW-28KB	JW-28ZB
JW-24KB	JW-24ZB
JW-26KB	JW-26ZB

Be sure to supply 5 VDC to the expansion rack panel without power supply module, through the 5VDC terminal block of the basic/expansion rack panel. Without a supply of 5VDC, the I/O modules cannot run.

When using the expansion rack panel, ensure the connection with the I/O expansion cable (optional) and the 5 VDC cable (the 5VDC cable are accessories of the I/O expansion cable). Make sure correct connections between plus and minus polarity of the 5VDC terminal and the IN/OUT sides of the I/O expansion cable. Mis-connections might damage the module or cause fire.

For wiring to the 5 VDC terminal block, use crimp-style terminals.

In order to prevent wire wastes from dropping into the module through a ventilation hole during the wiring work, keep the caution label stuck onto the upper side of the module.

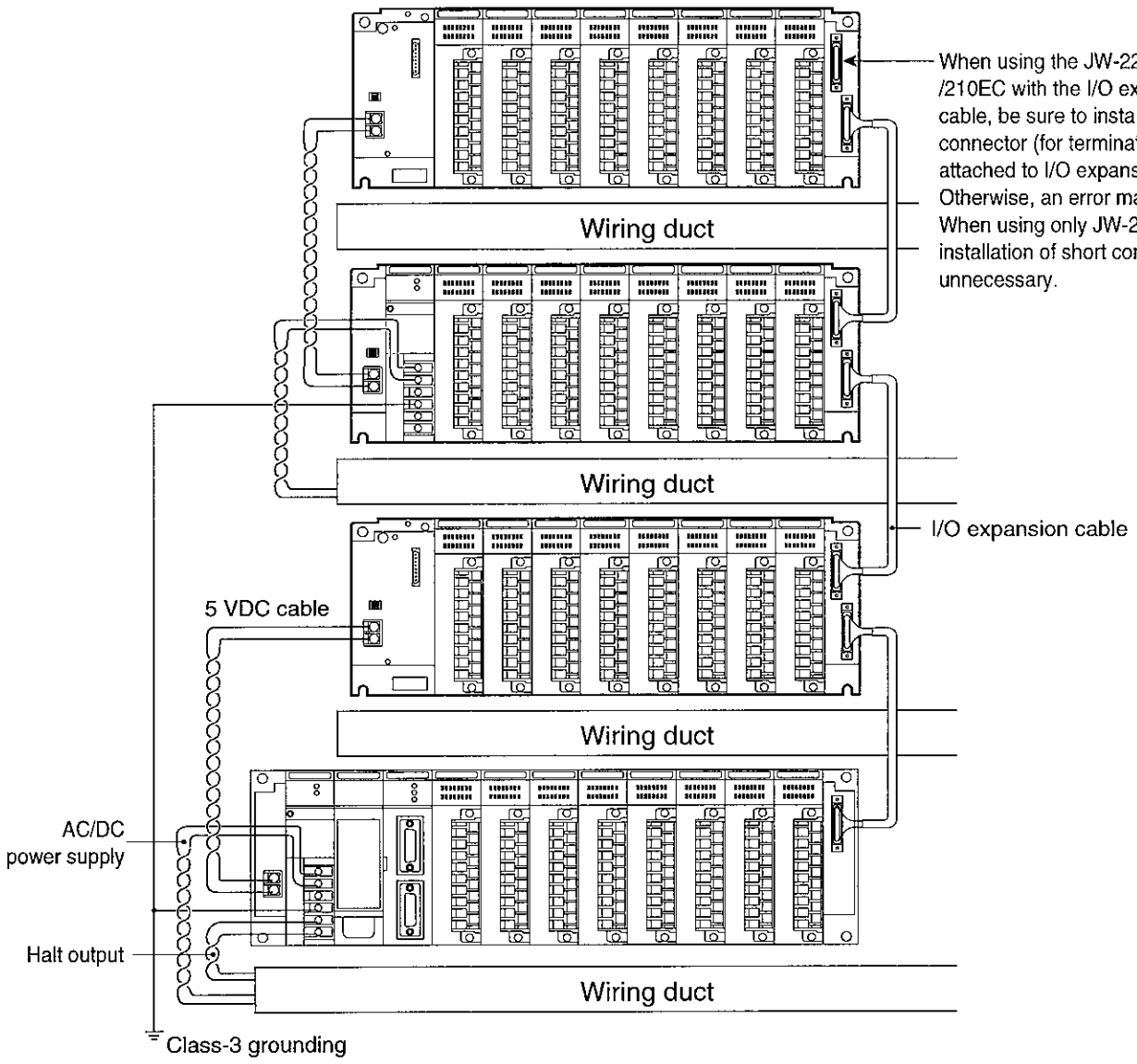
Tear OFF the caution label when all wiring work is finished.

Fasten the screw on the terminal block with a torque of less than 12kgf · cm.

After the wiring work for basic/expansion rack panels, reconfirm the state of wiring and installation.

As for the connection of the I/O expansion cable to the basic/expansion rack panels, refer to page 36 "I/O expansion cable".

6-3. Process of panel wiring



- Connect AC/DC power supply to the power supply module from the same power.
- Correctly wire the I/O expansion cable and the 5VDC cable.
- Do not place the I/O expansion cable and the 5 VDC cable in the same duct or pipe as the I/O lines and the power lines of the JW20H.

Chapter 7. ROM operation

This section explains how to register contents of the system memory and user's program into ROM, and the ROM operation method is also explained.
The ROM operation is available when using JW-21MO/21ME as a memory module.

7-1. What is ROM operation?

The ROM operation is a method of operating the JW20H by the content of the ROM, by storing the system memory or user program in the flash ROM, and transferring from ROM to RAM.
Saving of a program and more in the ROM is available, as the contents of the ROM do not disappear.
ROM operation is convenient for the following systems:

- Operation frequency is low.
- No alternation of program and system memory.
- Requires registering or loading programs quickly.

The ROM operation is available in four types as shown in the table below, depending on the setting value in the system memory #255.

Item	ROM operation			
Setting value of system memory #255	00(H) *1	10(H) *2	22(H)	44(H)
Transfer ROM to RAM	Transfer in manual after PC power ON	Transfer in automatically at PC power ON		
PC mode at power ON	Mode at PC power OFF		Stop mode	Run mode
Clear the data memory at transfer ROM to RAM	No (Hold that batteries have)		Yes	
Operation without batteries (See page 111 to 114)	Unavailable		Available	
Operation with batteries (See page 110)	Available			

*1 When setting value is 00(H), ROM operation operates normally. In this case, transfer ROM to RAM in manual operation of support tool after power ON, available operation for ROM contents.
*2 10(H) is settable when JW-21CU/22CU ROM version are version 2.2 or later. For checking method, see page 59.

■ Registerable area to ROM

Areas that can be registered in ROM are as follows :

- System memory: #200 to 377
- Program memory : 3.5K words
- Parameters in special/option modules
- Symbols : 768 at maximum
- I/O table

Data memory can not be registered in ROM.

Note 1: When setting parameters and symbols in special/option module, be aware that the setting area varies with using support tools (programmer : JW-13PG/2PG etc., multipurpose programmer : JW-50PG etc.).

Model name	Setting area	
	Parameter of special/option modules	Symbol settings
JW-2PG	Set in parameter area of special/option module	Set in symbol area
JW-11PG/ 12PG/13PG		
JW-10PG	Set in register area of the file 1	Set in register area of the file 2
ZW-101PG1		
JW-30PG		Set in symbol comment area
JW-32PG		
JW-50SP	Set in JW21/22 parameter of program edit	Set in symbol comment area of program edit
JW-40PG, JW-50PG		

Note 2: When the program is registered in the ROM, battery-less operation is also available under certain operation conditions. In battery-less operation, the current value of the latched relay and CNT are cleared when the power is OFF. See page 112 "No-battery operation" for battery-less operation.

Note 3: When operating the JW20H with battery-less operation at the ROM operation, set the memory protect swicth OFF. Set memory protect switch ON when the ROM does not transfer to RAM after switching on power. In OFF condition, write and change is availavle using support tools temporarily. When transfer ROM to RAM in ROM operation, RAM contents becomes ROM contents in previous state.

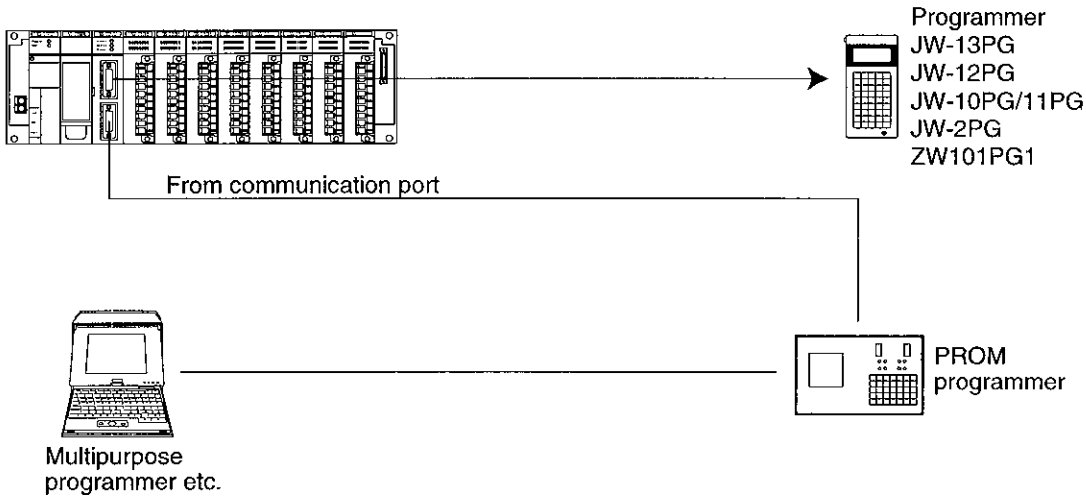
7-2. Prior to ROM operation

[1] Using modules in ROM operation

Memory module name	Installed ROM
JW-21MO	EPROM
JW-21ME	EEPROM

[2] Writing method in each ROM

(1) Writing in EPROM



Transfer a program to the PROM programmer through the communication port (JW-22CU) or the multipurpose programmer and the like, and write the program in the EPROM.
When using the JW-22CU as a control module, a program is transferable to a PROM programmer by connecting the communication port with the PROM programmer and by executing program transfer using the programmer. When using the JW-21CU as a control module, the above operation is not available.

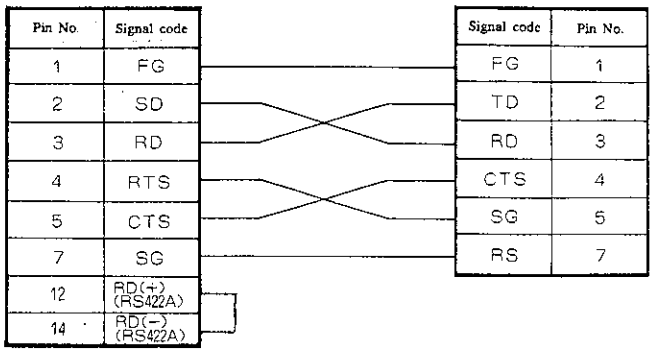
Note 1: See page 104 " Writing in ROM " for the transfer operation to the PROM programmer. See page 28 " Installing EPROM " for installation of the program registered ROM on the memory module.

Note 2: Connect between the communication port of the JW20H and the PROM programmer as follows :

• Connection with a PROM programmer : AF-9703; by ANDO ELECTRIC CO., LTD.

JW20H
Communication Port
(15P female connector)

PROM programmer (AF-9703)
connector (25P male)



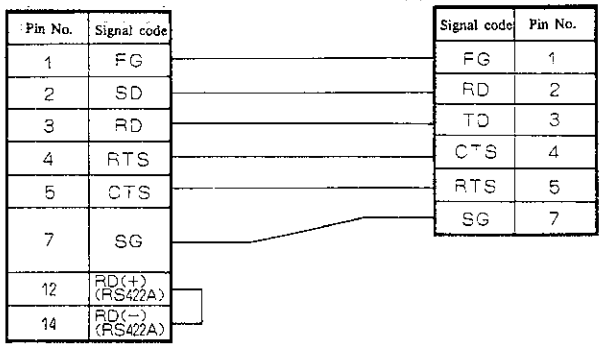
Pin No.	Signal code
1	FG
2	SD
3	RD
4	RTS
5	CTS
7	SG
12	RD(+) (RS422A)
14	RD(−) (RS422A)

Signal code	Pin No.
FG	1
TD	2
RD	3
CTS	4
SG	5
RS	7

• Connection with a PROM programmer : MODEL-1866A; MINATO ELECTRONICS INC.

JW20H
Communication Port
(15P female connector)

PROM programmer (MODEL-1866A)
connector



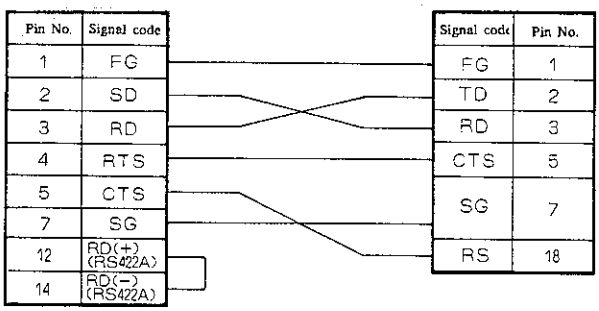
Pin No.	Signal code
1	FG
2	SD
3	RD
4	RTS
5	CTS
7	SG
12	RD(+) (RS422A)
14	RD(−) (RS422A)

Signal code	Pin No.
FG	1
RD	2
TD	3
CTS	4
RTS	5
SG	7

• Connection with a PROM programmer : TR4943; ADVANTEST CORPORATION

JW20H
Communication Port
(15P female connector)

PROM programmer (TR4943)
connector

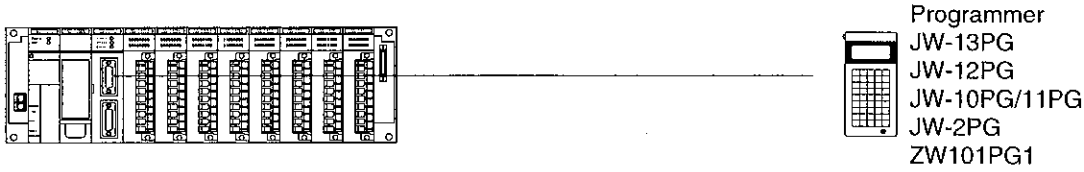


Pin No.	Signal code
1	FG
2	SD
3	RD
4	RTS
5	CTS
7	SG
12	RD(+) (RS422A)
14	RD(−) (RS422A)

Signal code	Pin No.
FG	1
TD	2
RD	3
CTS	5
SG	7
RS	18

Note 3: For the details of the PROM programmer, see the attached instruction manual.

(2) Writing in EPROM



Programmers (JW-13PG etc.) is available writing program in the JW20H executing writing operation.
See page 108 " Writing in EPROM " for the writing operation in EEPROM.

7-3. Writing in ROM

The areas that can be registered in ROM are as follows :

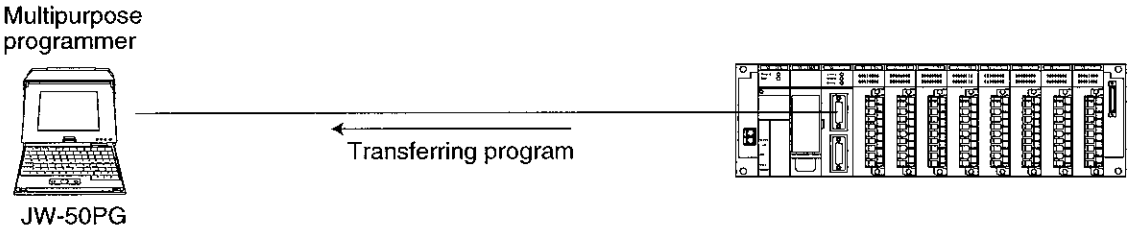
- System memory: #200 to 377
- Program memory : 3.5K words
- Parameters in special/option modules
- Symbols : 768 at maximum
- I/O table

[1] Writing in EPROM

(1) Writing using the multipurpose programmer: JW-50PG.

① Transfer a program in JW20H to JW-50PG.

- For transfer method in detail, refer to instruction manual attached to the JW-50PG.



② Set the system memory #255 (ROM operation).

System memory No.	Octal notation	Hexadecimal notation	Contents
#255	000	00	See page 99.
	020	10	
	042	22	
	104	44	

Note 1: When setting 22(H) or 44(H) in the system memory #255, the current values of the latched relay, CNT, etc. are not saved in memory depending on power failure when the battery-less operates.

③ Install EPROM to PROM programmer.

- Put the EPROM which has been installed in the memory module: JW-21MO, on the PROM programmer.

Note 2: When using the already-written EPROM, erase the stored program by a ultraviolet eraser, then put it on the PROM programmer.

To next page

From previous page

④ Transfer program to the PROM programmer.

- For the transfer procedure of program to the PROM programmer in detail, refert to instruction manual attached to the JW-50PG.

⑤ Write the transferred program in EPROM.

- For the operation procedure of the PROM programmer in detail, refert to instruction manual attached to the PROM programmer.

⑥ Disconnect power to JW20H.

⑦ Remove memory module from control module.

- For removing the memory module, see page 29 " Installation og memory module in control module ", and operate process of the installation in reverse.

⑧ Install the program written EPROM in memory module.

- See page 28 " Installation of EPROM " for installing the EPROM in the memory module.
- In case that memory protect switch of memory module is ON, setting ON to OFF.

⑨ Install memory module in control module.

- See page 29 " Installation of memory module in control module " for installing the memory module in the control module.

⑩ Connect power to JW20H.

(2) Writing using the communication port (JW-22CU)

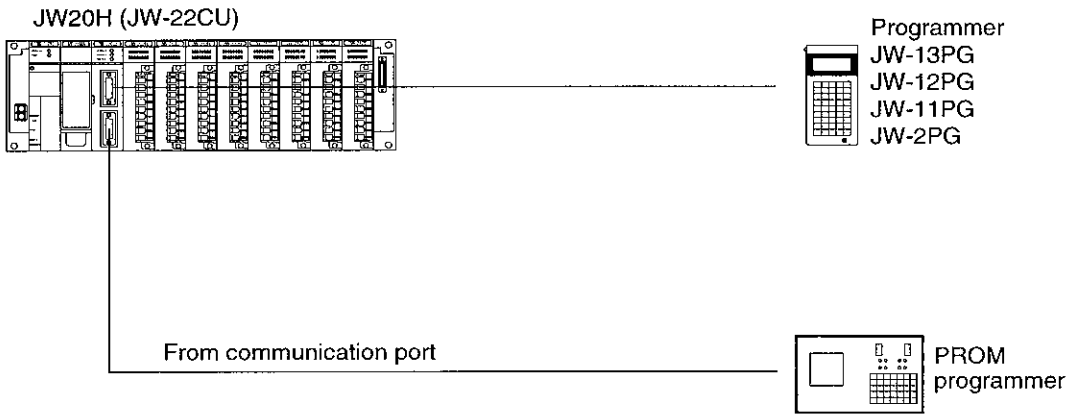
This section introduces program writing process in the EPROM using the communication port of the JW-22CU. This process is not available for the JW-21CU.

Note 1: When using the JW-22CU as control module and the program is over 3.5K words (the program is written over the address 06777), the JW-22CU cannot register this program into the ROM.

Note 2: Only JW-11PG/12PG/13PG and JW-2PG are available transferring programs from the communication port to the PROM programmer. Other programmers, such as JW-10PG etc. are not available in this operation.

① Connect between communication port and PROM programmer, and between a connactor for support tools and programmer.

- See page 102, and connect between a communication port and a PROM programmer.



② Set the system memory #255 (ROM operation).

System memory No.	Octal notation	Hexadecimal notation	Contents
#255	000	00	See page 99.
	020	10	
	042	22	
	104	44	

Note 3: When setting 22(H) or 44(H) in the system memory #255, the current values of the latched relay, CNT, etc. are not saved in memory depending on power failure when the battery-less operates.

③ Install EPROM to PROM programmer.

- Put the EPROM which has been installed in the memory module: JW-21MO, on the PROM programmer.

Note 4: When using the already-written EPROM, erase the stored program by a ultraviolet eraser, then put it on the PROM programmer.

To next page

From previous page

④ Transfer program to the PROM programmer.

・Operate the following process using a programmer.(An operation using the JW-12PG is indicated.)

⑤ Write the transferred program in EPROM.

・ For the operation procedure of the PROM programmer in detail, refert to instruction manual attached to the PROM programmer.

⑥ Disconnect power to JW20H.

⑦ Remove memory module from control module.

・ For removing the memory module, see page 29 " Installation og memory module in control module ", and operate process of the installation in reverse.

⑧ Install the program written EPROM in memory module.

・ See page 28 " Installation of EPROM " for installing the EPROM in the memory module.
・ In case that memory protect switch of memory module is ON, setting ON to OFF.

⑨ Install memory module in control module.

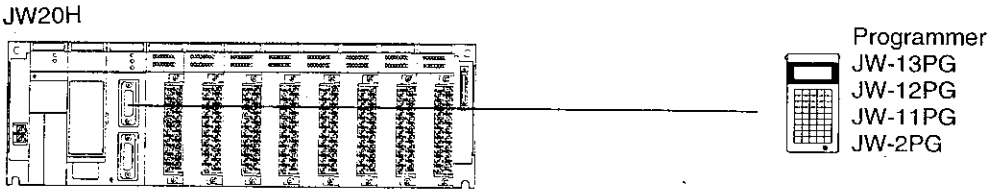
・ See page 29 " Installation of memory module in control module " for installing the memory module in the control module.

⑩ Connect power to JW20H.

Note 5: Transfer conditions from communication port follow system memory #236 and #237 (see page 51).The #236 and #237 is registered in the ROM, transfer in transfer conditions registered in the ROM.

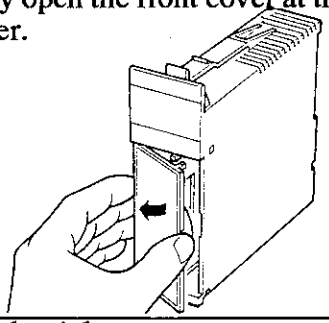
(3) Writing in EEPROM

A Memory Module for program writing in the EEPROM is JW-21ME. This process is not available, when using a JW-21MO and JW-21MA as Memory Modules.

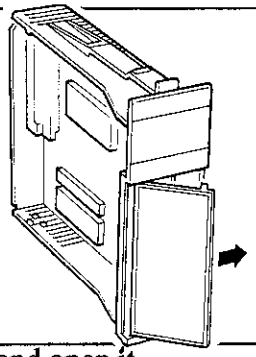


(1) Open front cover

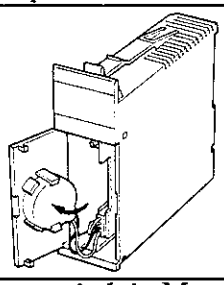
- Do not forcibly open the front cover at the fixed position. Forced opening may break the cover.



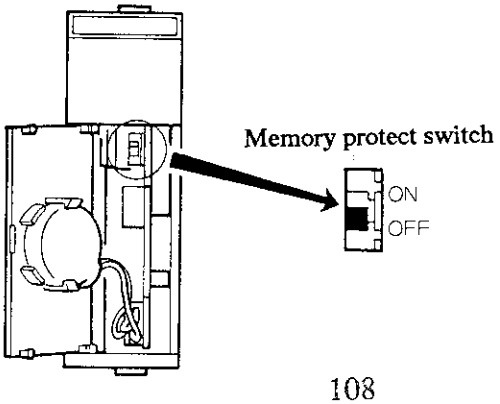
(2) Slide front cover to the right.



(3) Pull the front cover forward and open it.



(4) Switch "OFF" the memory protect switch in Memory Module.



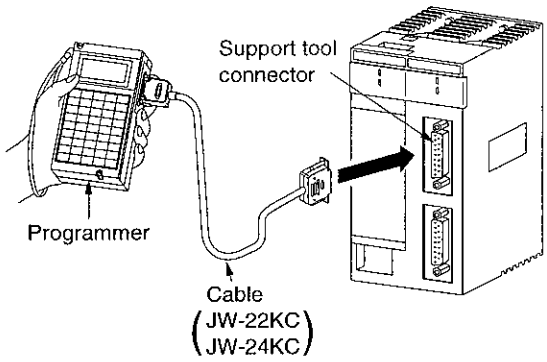
ON		Writing in program, system memory is prohibited.
OFF		Writing in program, system memory is available.

To next page

From previous page

⑤ Connect programmer with connector for support tools in cintrol module.

・For installation of programmer, refer to the instruction manual attached to the programmer.



⑥ Change the JW20H mode to program mode.

・Operate the following process for changing to program mode. (An operation using the JW-12PG is indicated.)

⑦ Set the system memory #255 (ROM operation).

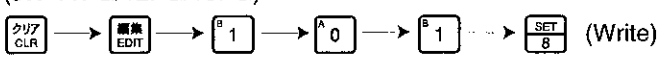
System memory No.	Octal notation	Hexadecimal notation	Contents
#255	000	00	See page 99.
	020	10	
	042	22	
	104	44	

Note 3: When setting 22(H) or 44(H) in the system memory #255, the current values of the latched relay, CNT, etc. are not saved in memory depending on power failure when the battery-less operates.

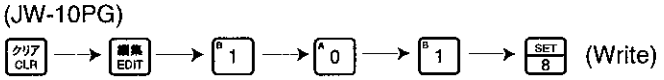
⑧ Transfers proghram to EEPROM.

・Operate the following process using the programmer.

(JW-11PG/12PG/13PG)



(JW-10PG)



7-4. ROM operation

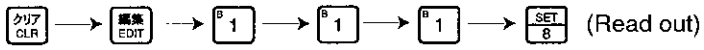
The ROM operation has two operation modes. One is operation with a battery, the other one is operation without a battery.

[1] With battery operation

Operation of the JW20H with a battery is available on the following setting:

Memory module	JW-21ME JW-21MO
Memory protect switch of memory module	OFF Available writing
Setting system memory #255 in ROM	00(H), 10(H), 22(H), 44(H)

The programmer: JW-12PG/2PG etc. transfers programs manually from the ROM to the RAM. For the detailed transfer process of programs from ROM to the RAM, follow the process below or see the instruction manual of the programmer.



(Read out)

Note 1: When transfer ROM to RAM manually, clear contents of the program memory and the system memory, prior to transferring programs.

Note 2: When the program size of the ROM is larger than the one of the memory module, a program transfer is not available.

- Transfer from ROM to RAM.
  Program size in ROM ≦ Program size of memory module.

- Transfer from ROM to RAM is not available.
  Program size in ROM > Program size of memory module.

[2] No-baterry operation

Operation of the JW20H without a battery is available under the following conditions:

Memory module	JW-21MO JW-21ME
Setting memory protect switch	OFF Available writing
Setting system memory # 255 in ROM	22(H) or 44(H) Without battery

For no-battery operation in detail, see next page.

Note 1: A battery is installed in memory module: JW-21MO/JW-21ME for data protection. When operating the module without a battery, connect a battery-less connector attached to the memory module, instead of a battery. For details of the connection of the battery-less connector, see page 113 " Procedure of no-battery operation."

Note 2 : While in ROM operation, error codes are provided concerning transferring programs from the ROM to RAM. When the error keeps lighting after switching ON power for ROM operation, see the information about self diagnosis in the programming manual, ladder instruction version.

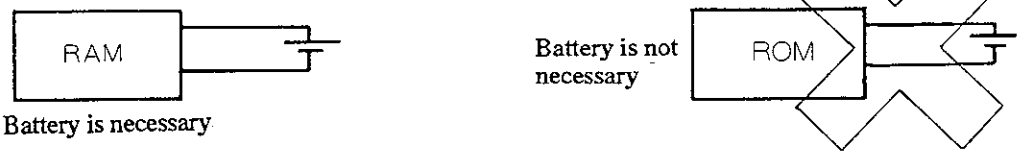
Note 3 : When the battery is removed and power is disconnected, data of the latched relays and the register as well as clock feature (JW-22CU only) can not function. In case of using the clock feature, operate the memory module with battery.

7-5 No-Battery Operation

[1] No-battery operation

After programs are registered in the ROM, operation of the JW20H is available without a battery for memory back-up.

The operation of the JW20H without a battery for memory back-up is called no-battery operation.



[2] Precautions for no-battery operation

Be aware of the following points in no-battery operation:

- After supplying power, programs are required to be transferred from the ROM to the RAM. When you don't want to transfer programs from the ROM to the RAM after power is switched on, set the memory protect switch to "ON."
- All the differential memories are cleared.
- All the latched relays are cleared.
- All the data in TMR, CNT and the register are cleared.
- The clock feature stops, after put off power supplied to the JW20H The clock feature restarts operation when power is "ON." The clock feature is only installed in the JW-22CU as standard. Install a back-up battery, when using the clock feature.
- Set the memory protect switch to "OFF," in no-battery operation.

[3] How to run no-battery operation

Write programs in the ROM (EPROM/EEPROM) in no-battery operation.

See page 104 "Writing in ROM" when writing programs in the ROM.

In ROM operation, use the EPROM/EEPROM installed in a Memory Module: JW-21MO/JW-21ME, as the ROM.

[4] Procedure of no-battery operation

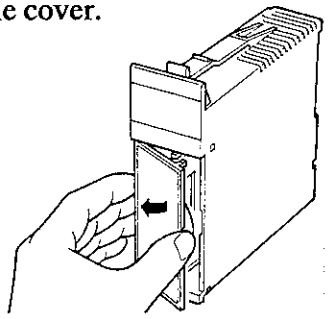
After setting the ROM in the Memory Module, operate the system for no-battery operation as follows:

(1) Disconnect power to JW20H .

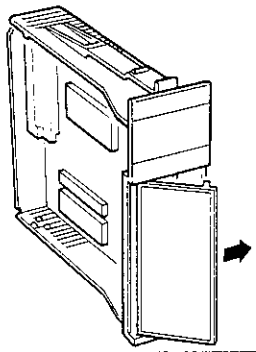
↓

(2) Open front cover

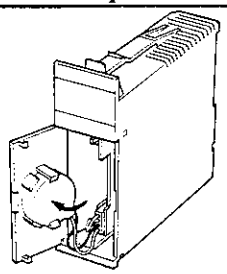
• Do not open forcedly the cover from the fixed position. Forcedly opening may break the cover.



(3) Slide front cover to the right .

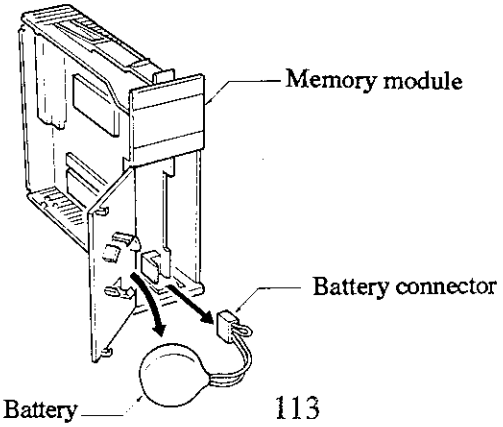


(4) Pull front cover front and open it.



(5) Remove battery installed on the rear of the front door in Memory Module.

• Remove the battery from the battery connector.



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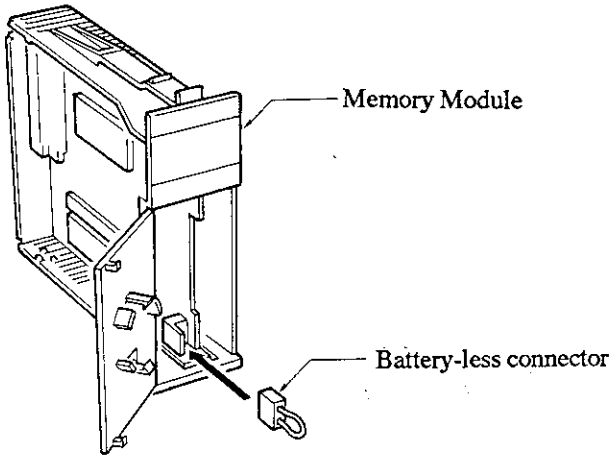
↓

(6) Set battery-less connector to battery connector.

• The battery-less connector is attached to the Memory Module.



(7) Supply power source to JW20H.

Note 1 Writing in ROM also execute writing contents of the system memory. Accordingly, set the system memory #255 (setting to no-battery operation) as $22_{(H)}$ or $44_{(H)}$, prior to write to the ROM. Without setting $22_{(H)}$ or $44_{(H)}$, no-battery operation is not available.

Note 2 Be sure to connect the battery-less connector after removing the battery. Without the battery-less connector, the error code "22" is stored in the system memory #160-167 as the battery error, and the special relay 07372 will switch "ON."

Note 3 In no-battery operation, the latched relay, the current value of CNT, and the contents of the register do not remain stored at power failure.

Chapter 8 Trial Run

8-1 Check Points Prior to Trial Run

When installing and wiring are completed, check the following points, prior to supplying power to the JW20H.

(1) Check the connection conditions of the power lines and the input/output lines.

↓

(2) Check the connecting conditions of the I/O Expansion Cable and the 5 vDC cable

↓

(3) Check the connection of the grounding line.

↓

(4) Check the fixing conditions of the Memory Module.

↓

(5) Check the fixing conditions of the battery or the battery-less connector.

↓

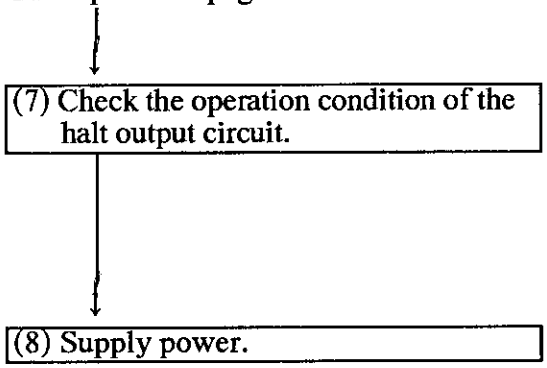
(6) Check the voltage of the power supply source.

↓

To next page

No	Check contents
(1)	• Whether the wiring is correct ? • Whether the screws in the terminal block are not loose? • Whether the fitting of the connector is correct? • Whether the each module is fixed securely? • Whether the cable size is correct?
(2)	• Whether these cables are connected correctly and fixed firmly between Basic/Expansion Rack Panels?
(3)	• Whether class-3 grounding is correctly grounded? • Whether the grounding is not co-grounded with a high voltage board?
(4)	• Whether Memory Module is fixed correctly? • Whether ROM is installed correctly? (in ROM operation)
(5)	• Whether battery is connected correctly in battery connector in Memory Module? (in RAM operation)? • Whether battery-less connector is connected correctly in battery connector?
(6)	• Whether power voltage of power supply is within rated voltage? AC power supply (JW-21OU); 85 to 246 VAC, 47 to 63 Hz, AC power supply (JW-31PU); 85 to 132 VAC, 47 to 63 Hz, DC power supply (JW-22PU); 20.4 to 32 VDC

From previous page



No	Check contents
(7)	• Whether halt output is connected properly with external circuit in outside JW20H?

8-2 Operation method for trial run

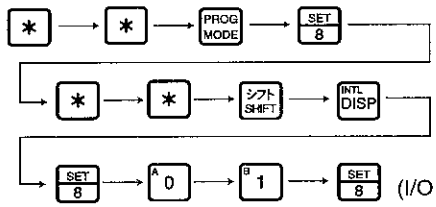
Operate the JW20H according to following process after precautions for operation is checked.

① Supply power.

② Clear and set the system memory.

③ Register I/O table.

・Registration process in I/O table



(I/O table registration)

No.	Check contents
①	1. Check the voltage of input power supply. 2. Switch OFF the memory protect switch in the memory module. 3. Connect the programmer or the multi-purpose programmer. 4. Supply power. 5. Check whether the POWER lamp in the power supply module is ON.
②	1. See the programming manual, ladder instruction version.
③	1. Register I/O table using the progammer.

The JW20H does not operate without registering I/O table.
The JW20H allocates the installed module type and relay numbers per each rack No. and slot No.

Note 1: I/O table is registered as no installation of modules at delivery.

Note 2: The registration of I/O table is also necessary when modules are changed.
Otherwise, the JW20H operates according to the former registered contents in the I/O table.

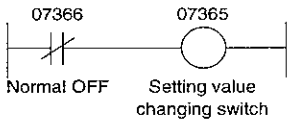
Note 3: In this section, the operation process of the programmer: JW-13PG are given. See page 47, "Allocation of the relay No." for operation using support tools.

To next page

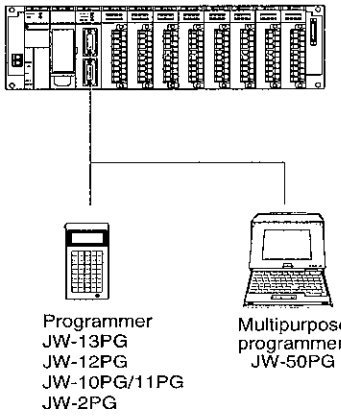
From previous page

④ Check the wiring to I/O module.

Note 4: Switch ON the setting value changing switch: 07365, prior to set the forcing switch ON/OFF for output.



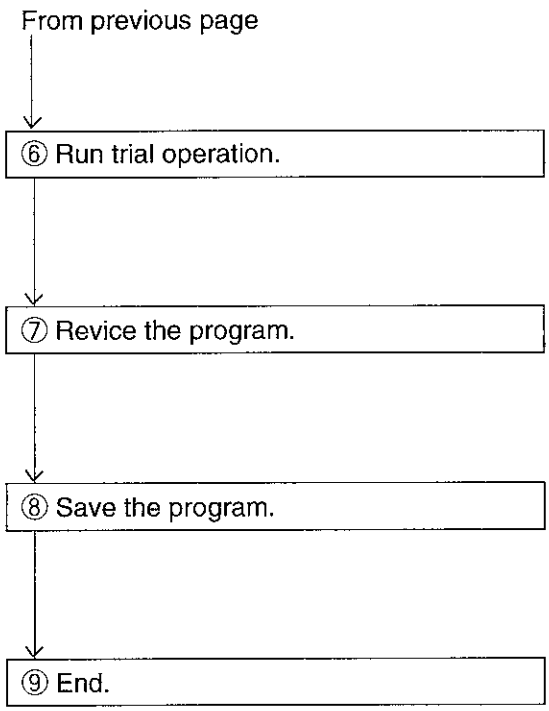
⑤ Execute programming.



Note 5: Install a battery in the memory module before programming.

To next page

No.	Check contents
④	1. Check the input part wiring using the display of the input module or the monitoring function of the programmer. 2. Check the output part wiring by forcing the switch ON/OFF of the output circuit in the changing mode of the programmer.
⑤	1. Input a program using the programmer or the multipurpose programmer. 2. Transfer a program to the control module when the program is saved in the multi-purpose programmer.



No.	Check contents
⑥	1. Confirm whether the RUN lamp in the power supply module is ON. 2. Confirm each sequential motion.
⑦	1. Revice the program, if it is not correct.
⑧	1. Write the program in a floppy disk or a ROM. 2. Print out the program using a printer.

8-3. Self-Diagnosis

Self-diagnosis function (the contents of self-diagnosis in the JW-21CU are the as same as those in JW-22CU)

Item			Contents	PC operating state	Halt output	Control module	Power supply module's indicator		Special relay	Error code (BCD code)	
						FAULT	POWER	RUN		Special register □0734	System memory #160 to #167
Self-diagnosis	Memory failure		Parity check	Stop	Open	ON	ON	OFF	07370	21	
			Instruction code check							24	
			System memory setup check							23	
			Program ROM check							25	
			Data ROM check							26	
			Program ROM size check							27	
	CPU failure		Watchdog timer						07371	31	
			RAM check(R/W)							32	
			Parity check							33	
			Hardware check							35	
	I/O failure	At refreshing	I/O data bus						07373	44	
			Output data check							42	
			Installed module check							40	
			I/O rack panel error							48	
		At table verifiing	Table verify error							60	
			Switch verify error							61	
		At table registration	Table registration error							70	
			Missing module error							71	
			I/O point overflow error							72	
			SW setting error							73	
	Special I/O failure		Hardware error						07375	46	
			Parameter error							47	
	Option failure		Hardware error						07374	53	
	Power supply failure		Power failure or voltage drop			OFF	OFF		07377	13	
	Expansion power supply failure		Power failure or voltage drop			ON	ON		07376	43	
	Battery failure		Battery voltage drop or battery not inserted	Run	Close			ON	07372	22	
Halt output			Relay output, 100/200 VAC, 30 VDC, 1A, Turned ON (closed) during PC operation.								

Chapter 9. Maintenance and Check

9-1. Periodical check

The following table is the recommended periodical check of used items, so as to keep the JW20H operating normally and in the best condition:

■ **General items**

Check items	Check contents	Standard	Remarks
Ambient temperature	Within the specifications (Temperature in the control box becomes the ambient temperature when the JW20H is installed in a control box.)	0 to 55°C	0 to 40°C when the hand-held programmer is installed.
Ambient humidity		35 to 90% RH	35 to 85% RH and no condensation when the hand-held programmer is installed.
Atmosphere		No corrosive gas, no dust	———
Vibration, shock		No	

■ **Control module**

Check items	Check contents	Standard	Remarks
FAULT lamp	Make a visual check the FAULT (error) lamp	Light OFF	
Installed condition	The module is fixed firmly	No looseness	

■ **Memory module**

Check items	Check contents	Standard	Remarks
Battery	That the available period is over.	Within the validity.	At RAM operation.
Installed condition	The module is fixed firmly	No looseness	

■ **Basic/expansion rack panel**

Check items	Check contents	Standard	
Connection cable	The I/O expansion cable and 5 VDC cable are connected firmly.	No looseness	
Installed condition	It is fixed firmly on a panel.		

■ Power supply module

Check items	Check contents	Standard	Remarks
Input power	Measure input voltage at the terminal block and check that it is within the specification.	AC power (JW-21PU) 85 to 264 VAC AC power (JW-31PU) 85 to 132 VAC DC power (JW-22PU) 20.4 to 32 VDC	
Installed condition	The module is fixed firmly.	No looseness	
	Terminal block screws have not loosened.		

■ Input/output module

Check items	Check contents	Standard	Remarks
Input or output power supply	That the voltage supplied at cable to input/output module is within the specification. (Measure the "ON" level voltage in case of the output module)	• 100/120 VAC input module 85 to 132 VAC	JW-201N JW-211N
		• DC input module 10 to 26.4 VDC	JW-202N JW-212N JW-214N
		• 200/240 VAC input module 170 to 250 VAC	JW-203N
		• DC output module 10 to 27 VDC	JW-202S
		• AC output module 15 to 250 VAC	JW-203S JW-213S
		• DC output module 4.75 to 27 VDC	JW-212S
		• DC output module 4.75 to 30 VDC	JW-232S
		• Relay output module AC: 250 VAC or less DC: 30 VDC or less	JW-204S JW-214S
Installed condition	The each module is fixed firmly	No looseness	———
	Terminal block screws have not loosened.		

■ Program

Check items	Check contents	Standard	Remarks
Floppy diskette	That the diskette is not over the rated register period.	Register the data in the floppy diskette changing every.	———

Note: Register a program in a floppy diskette using a ladder software in JW20H. The handling and maintenance is easy when a program is stored in a floppy diskette.

9-2 Exchanging Batteries

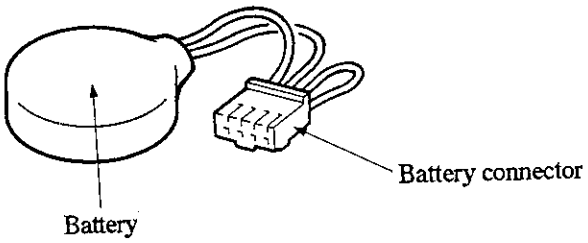
Replacement of a battery for memory back-up is necessary when operating theJW20Hin ROM or ROM operation and using a clock feature(JW-22CU).

Exchange battery for memory back-up within its validity.

Battery module can be replaced while supplying power to the JW20H.

Model name of Battery module

UBATN5005NCZZ



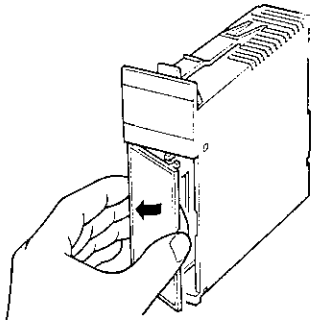
Battery exchange procedure

(1) Prepare a new battery.

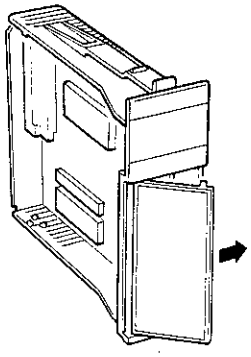
↓

(2) Open the front cover.

• Do not force it open. Using force may break the cover.



(3) Slide the front cover to the right.



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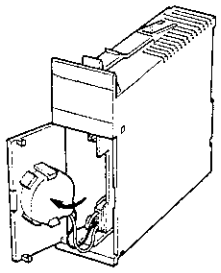
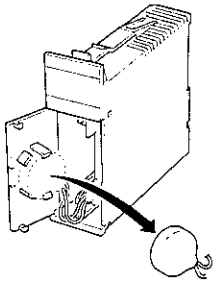
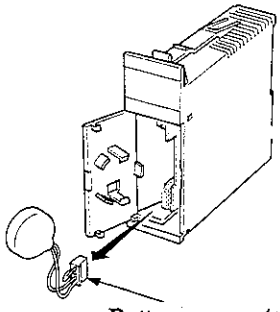
(4) Pull the front cover forward, and open the cover.



(5) Remove battery from battery guide attached to the back side of the front cover.

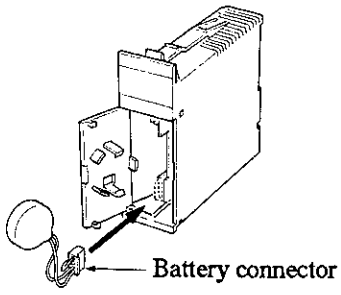


(6) Disconnect the battery module connector from the memory module battery connector.



(7) Insert a new battery module connector in the battery connector of the memory module.

- The battery change must completed within 5 minutes. Otherwise, the memory may be erased.



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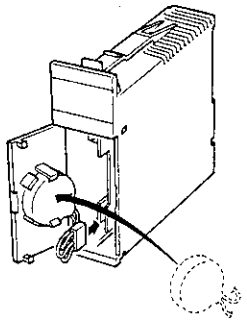
(8) Fix the battery to the battery guide.



(9) Close the front cover of the Memory Module, and stick a battery validity date label on the cover.

- Be sure to note the next replacement date on the battery validity date label.

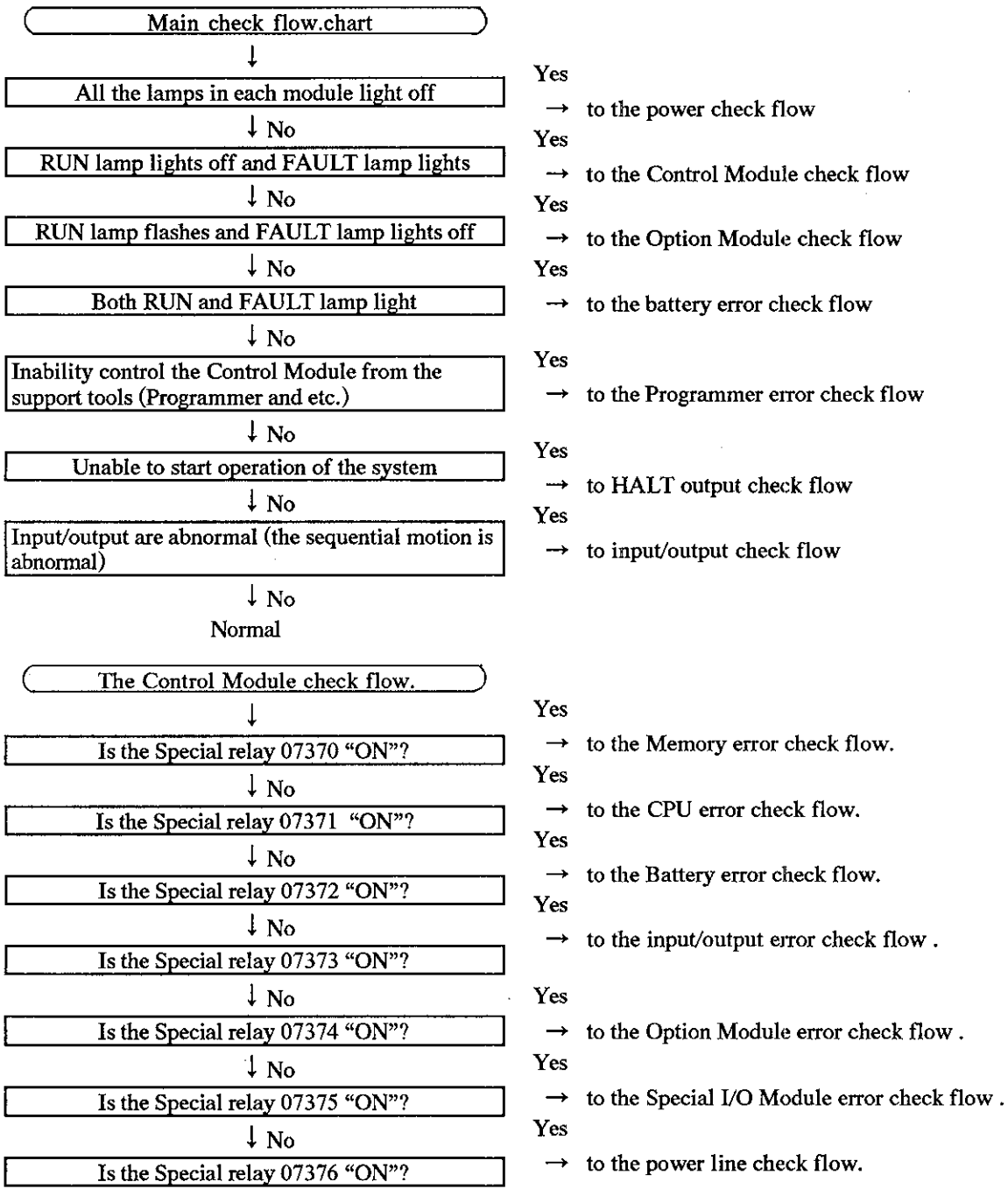
Note 1 Peel off the old battery validity date label prior to applying the new label.

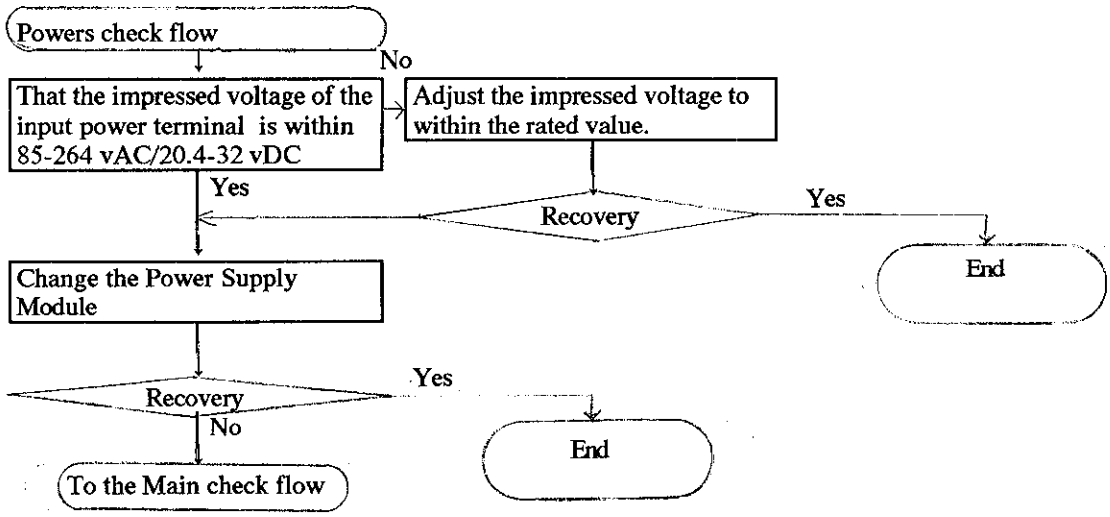
Note 2 Do not cause a short circuit between plus and minus poles in batteries ,nor charge, open, heat, throw in a fire, as it is dangerous. It may cause fire, bursting, leaking of liquid, etc.

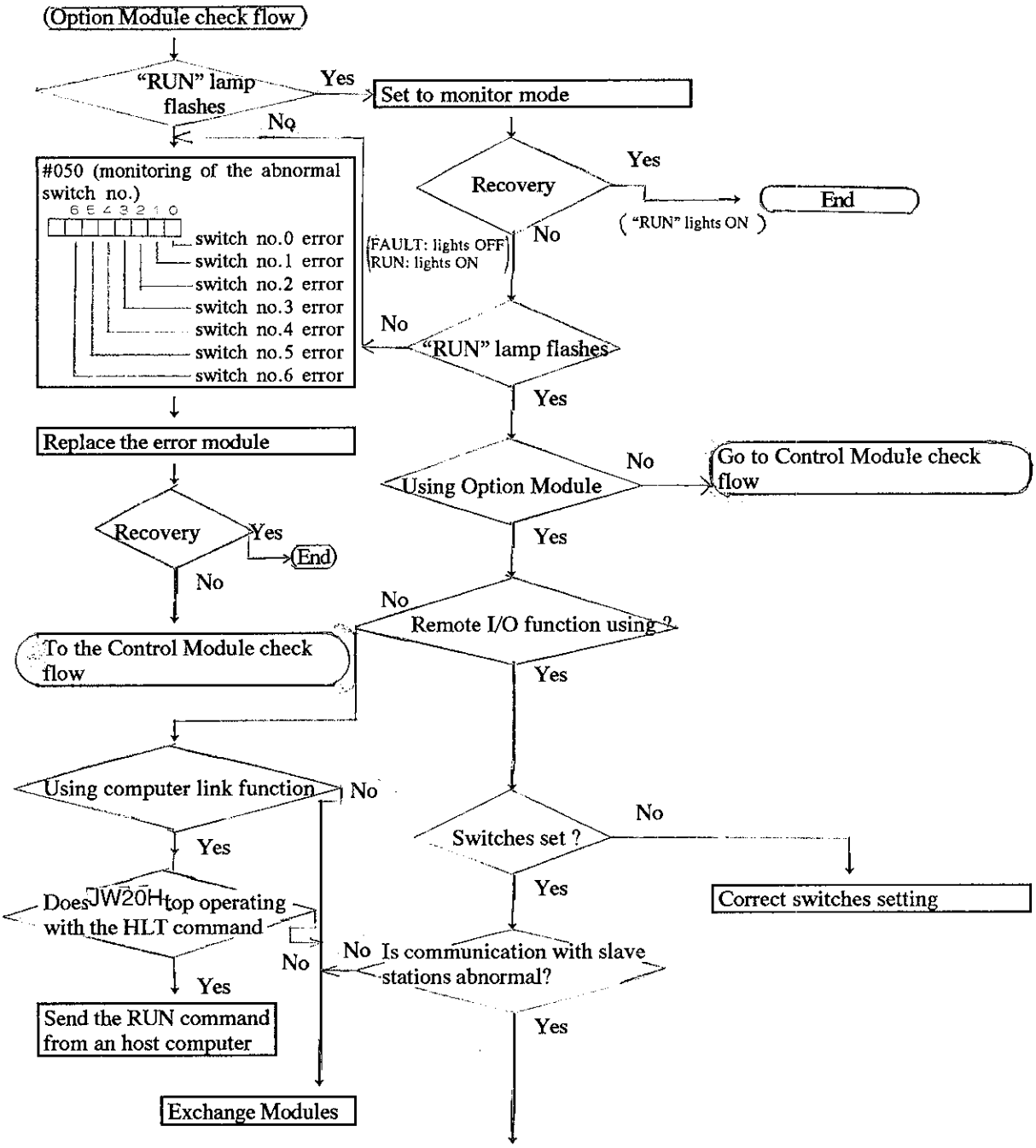
Note 3: Do not subject the battery to impact of any kind. Do not pull on the lead wires of the battery, or liquid leakage accident may occur.

9-3 Check at Abnormal Conditions

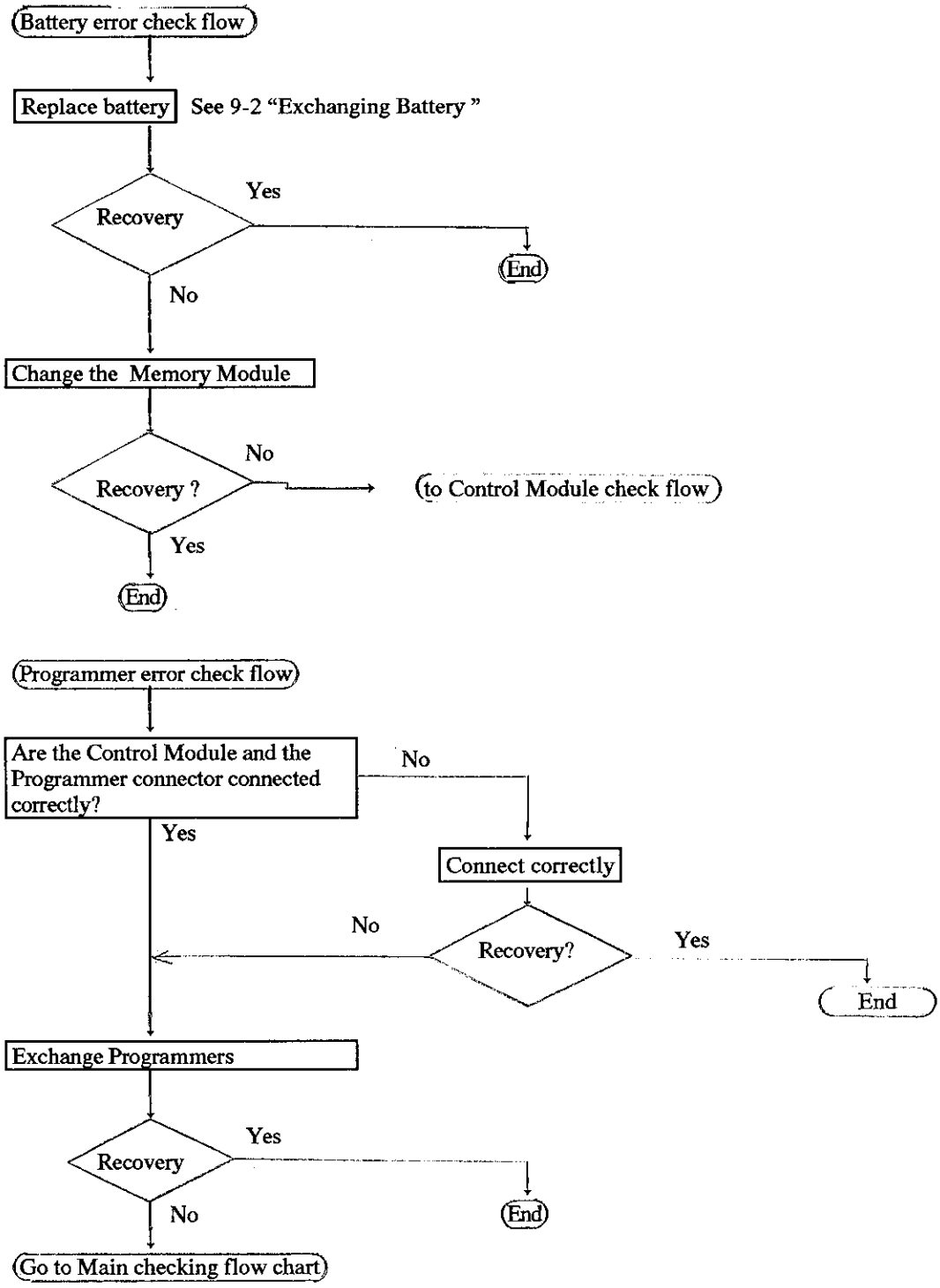
This section shows a flow chart for general checking of abnormal conditions for your immediate reference:

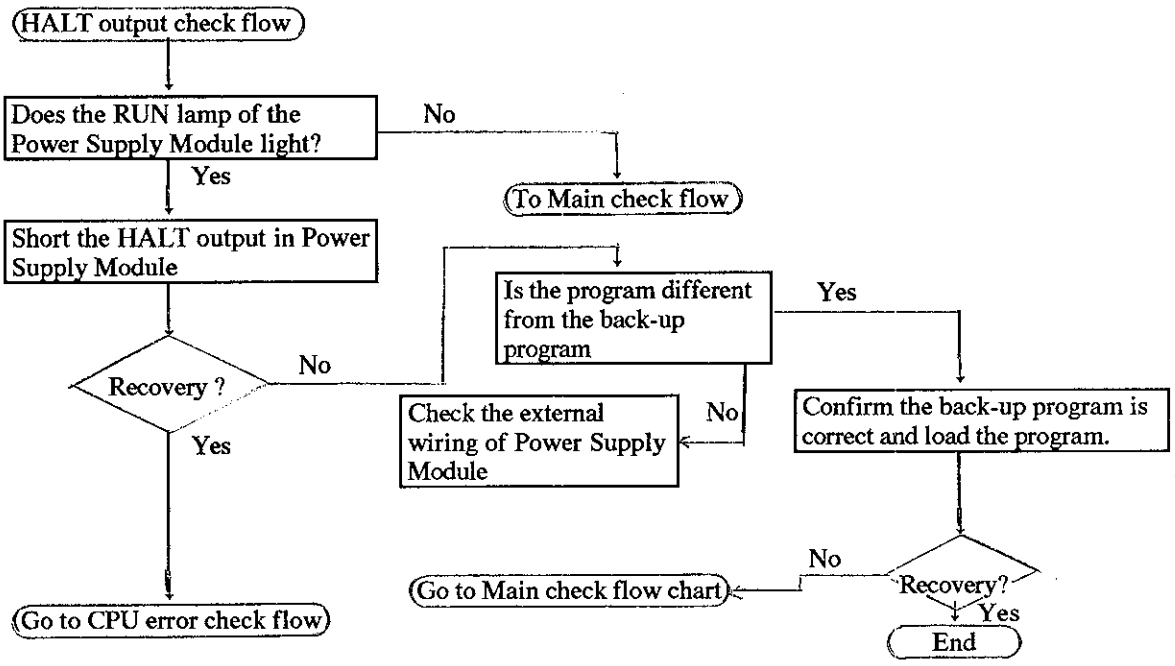



Powers check flow
No
That the impressed voltage of the input power terminal is within 85-264 vAC/20.4-32 vDC
Adjust the impressed voltage to within the rated value.
Yes
Recovery
Yes
End
Change the Power Supply Module
Recovery
Yes
No
End
To the Main check flow



- Is the communication cable the recommended one?
- Are both ends of communication lines of the termination resistance switch on?
- Are the communication cables and connectors in the remote master stations or slave stations disconnected?
- Is the wiring divided?
- Is the shield line grounded in each module?
- Is the communication cable closed or parallel to a high voltage line and a power line?
- Is the total length of the communication cable within the allowance.
- Is the power source of a slave station disconnected?


Battery error check flow
Replace battery
See 9-2 "Exchanging Battery"
Recovery
Yes
End
No
Change the Memory Module
Recovery ?
No
to Control Module check flow
Yes
End
Programmer error check flow
Are the Control Module and the Programmer connector connected correctly?
No
Yes
Connect correctly
No
Recovery?
Yes
End
Exchange Programmers
Recovery
Yes
End
No
Go to Main checking flow chart


HALT output check flow
Does the RUN lamp of the Power Supply Module light?
No
Yes
To Main check flow
Short the HALT output in Power Supply Module
Is the program different from the back-up program
Yes
Recovery ?
No
Yes
Check the external wiring of Power Supply Module
No
Confirm the back-up program is correct and load the program.
No
Recovery?
Yes
Go to Main check flow chart
End
Go to CPU error check flow

Input/Output Module check flow

Using Option Module

No

Yes

Through Option Module check flow chart

No

Go to Option Module check flow chart

Yes

Does the program match with the back up program

Yes

Recovery ?

Yes

No

To the Main check flow

End

No

Load the program after checking the back-up program

See the further check flow chart based on the external circuit indicated in the right.

PL lights without pushing PB

PL doesn't light after pushing PB

Does 00020 LED lamp in Output Module light?

Yes

Has the fuse of Output Module brown?

Yes

Replace fuse element (the same models of the accessory rating)

No

Yes

Does the PL light when short circuit terminal 00020 and common terminal in Output Module

No

Check the external wiring of the Output Module (disconnected,the lamp browns out)

Does the ON lamp light when monitoring OUT 00020 by Programmer?

Yes

Yes

No

Replace Output Module

Does the ON lamp light when monitoring STR00000 by a Programmer?

Yes

No

Go to CPU error check flow

Does the 00000 LED lamp in Input Module light?

Yes

No

Does the voltage of the 00000 terminal in Input Module is charged specified?

Yes

No

Check the external wiring of Input Module (disconnection, PB malfunction)

Replace Input Module

Input Module

PB

00000

Common

Output Module

PL

00020

Common

Ladder instruction

00000

00020

Re-confirm the specifications for Output Module. In case of light load, the PL does not become OFF due to the leakage current.

No

Exchange Replace Output Module

Does 00020 LED lamp in Output Module light

No

Yes

Does ON lamp light when monitoring the OUT00020 by Programmer

No

Yes

Check that the program hasn't changed with monitoring

Does the ON lamp light while monitoring STR 00000 by program monitor

Yes

No

To CPU error check flow

Does 00000 LED lamp light

Yes

No

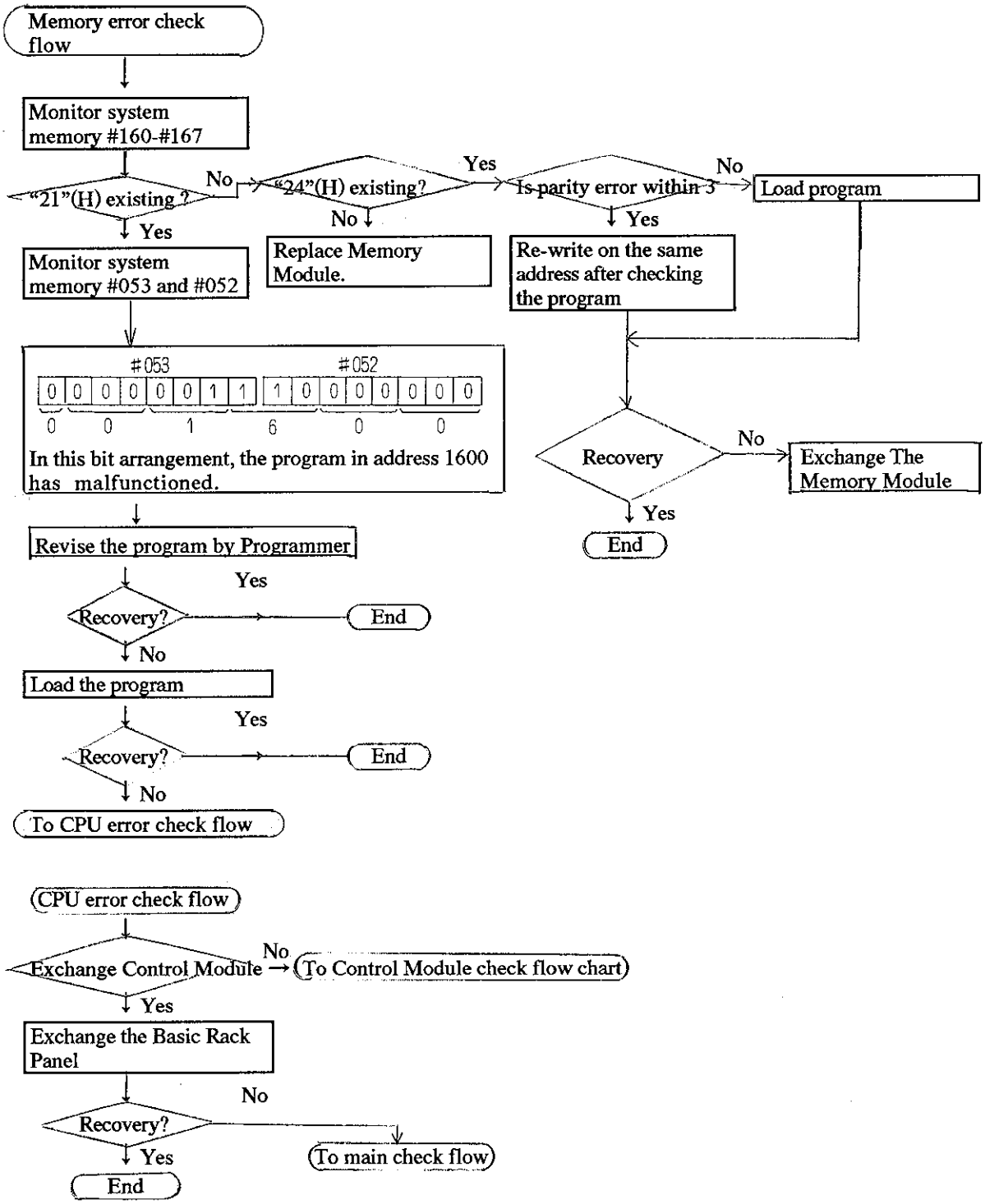
Is the voltage between 00000 and common terminal in Input Module zero or not

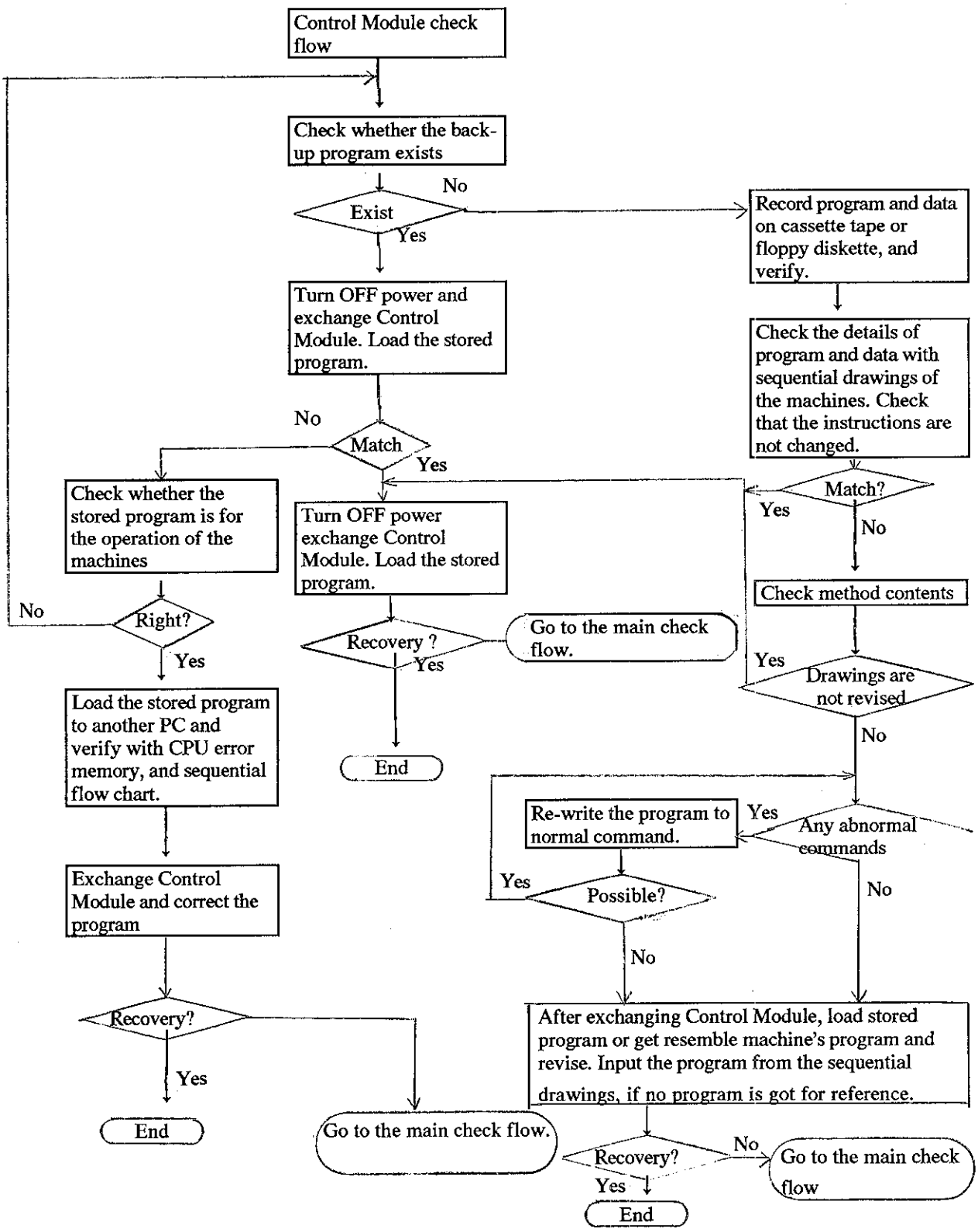
Yes

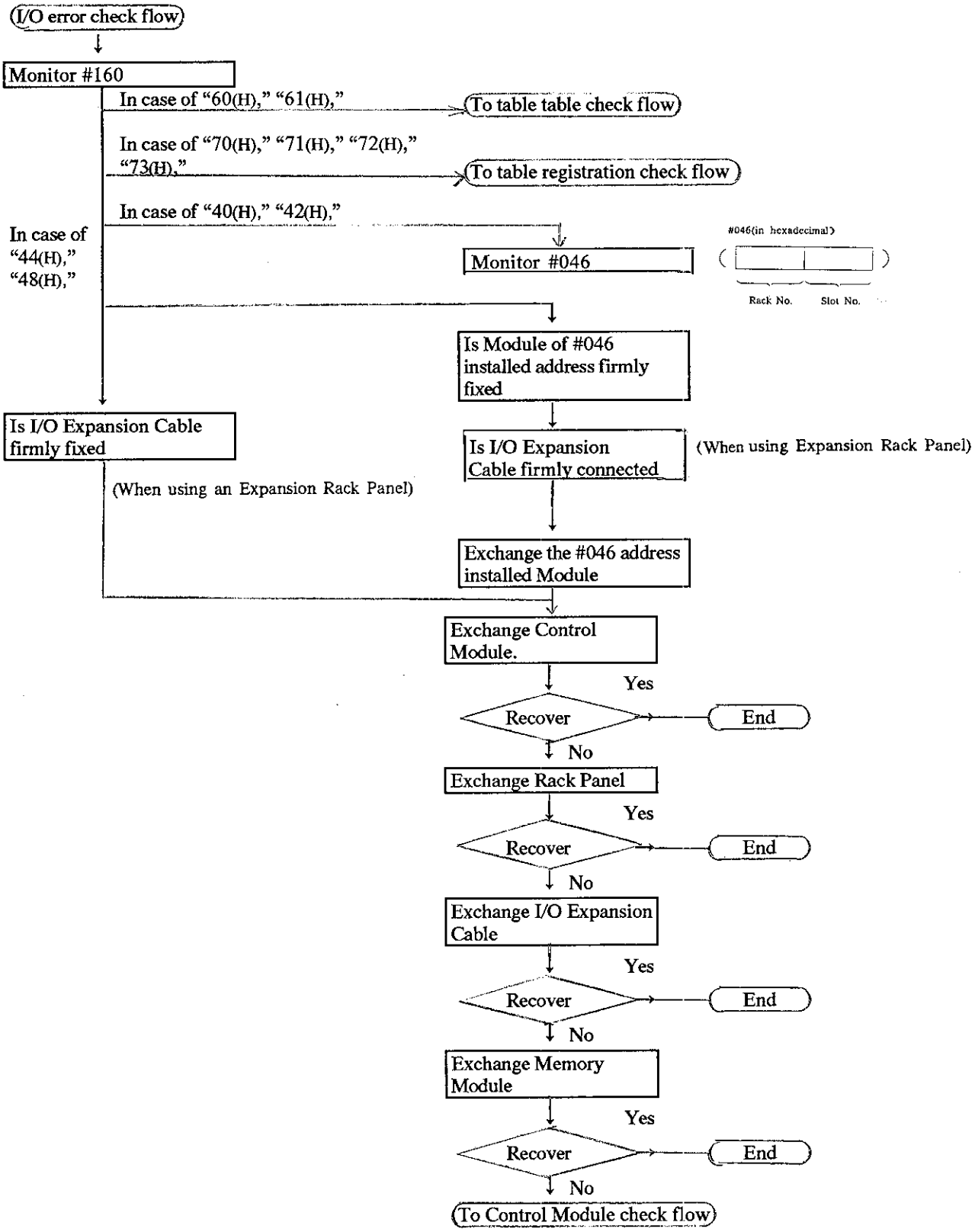
No

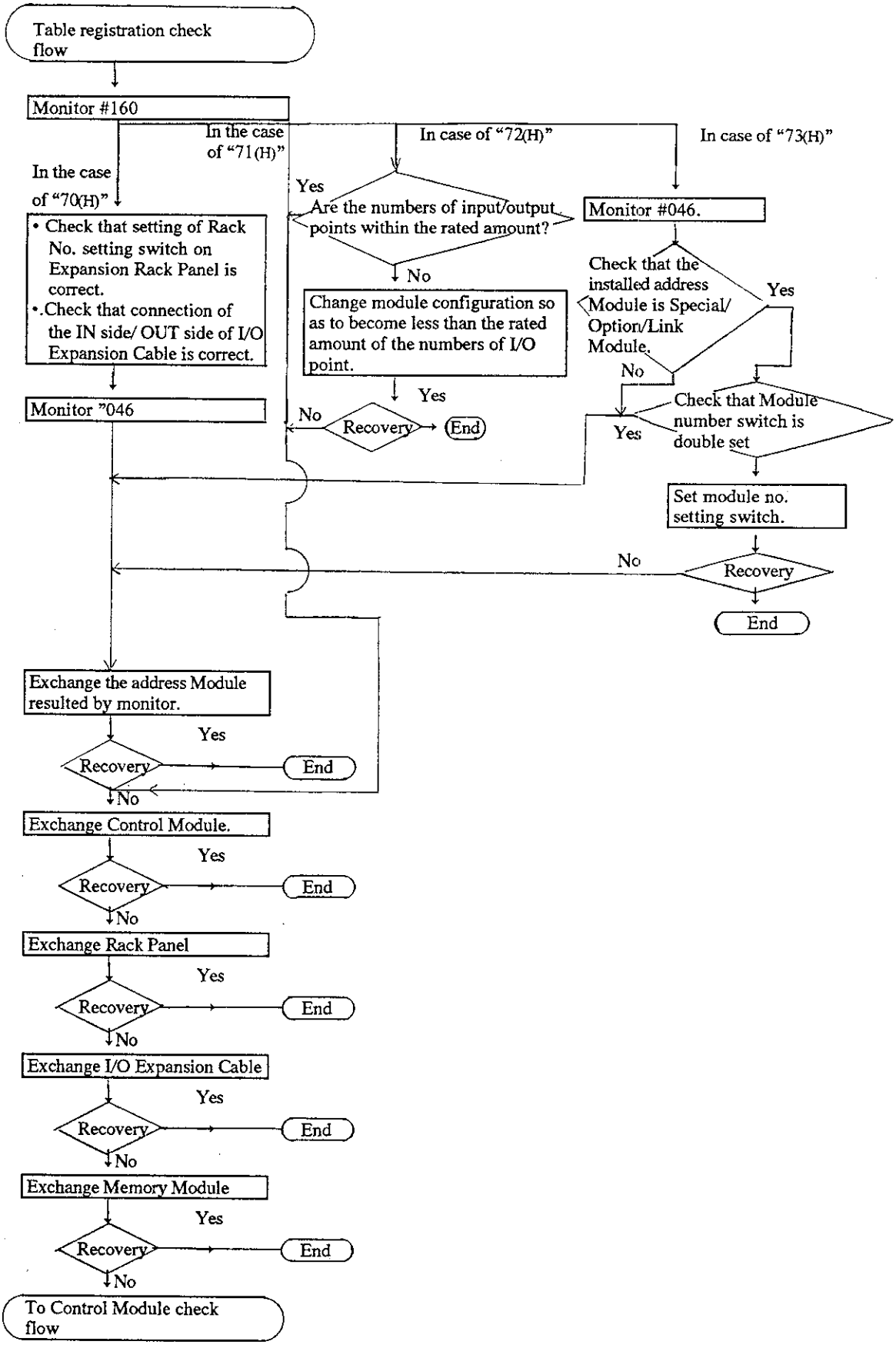
Check the external wiring of Input Module (shorted, PB malfunction)

Replace Input Module

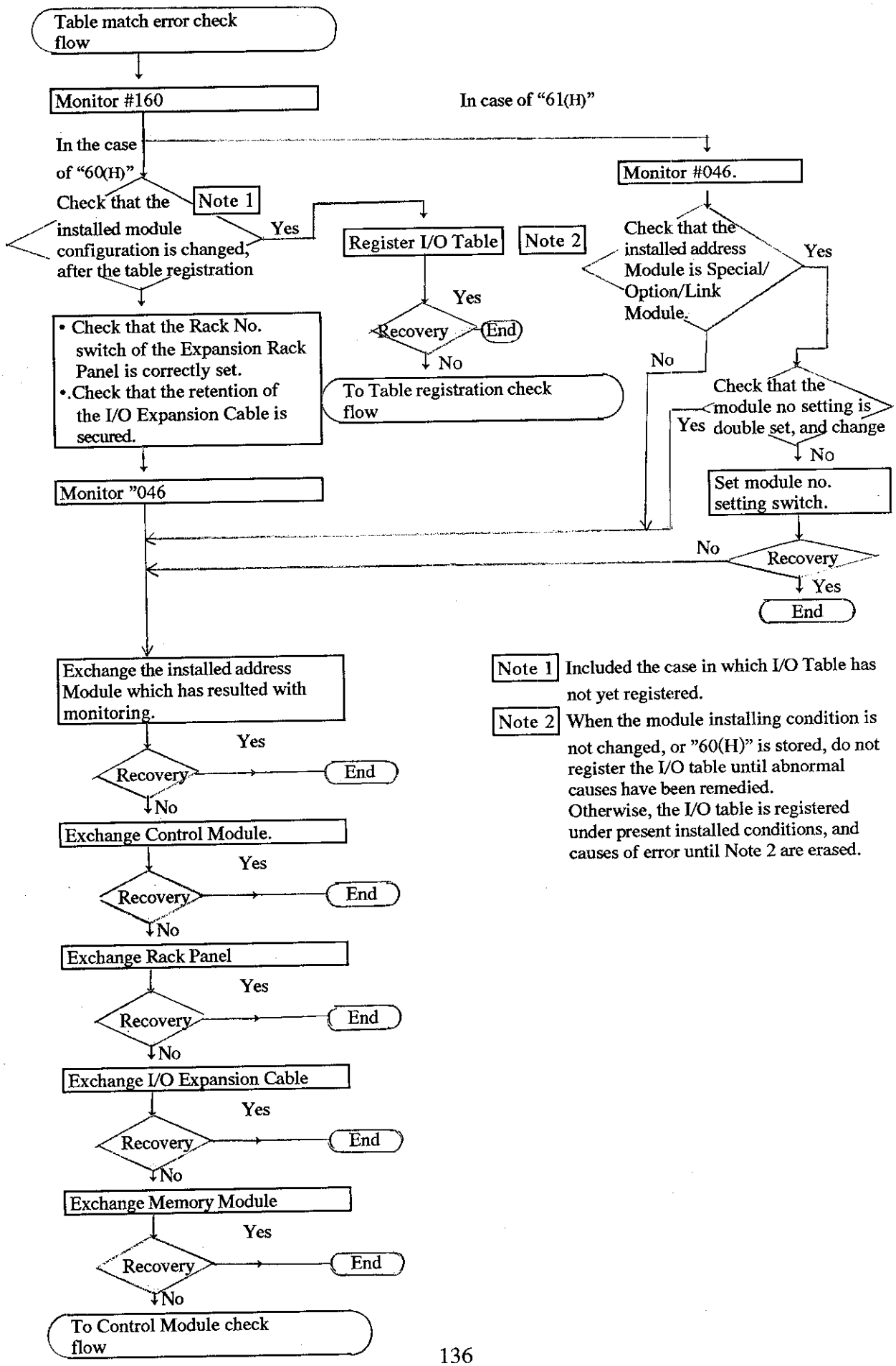

Memory error check flow
Monitor system memory #160-#167
"21"(H) existing ?
No
"24"(H) existing?
Yes
No
Is parity error within 3
No
Load program
Yes
Yes
No
Monitor system memory #053 and #052
Replace Memory Module.
Re-write on the same address after checking the program
#053
#052
0 0 0 0 0 0 1 1
1 0 0 0 0 0 0 0
0 0 1 6 0 0
In this bit arrangement, the program in address 1600 has malfunctioned.
Recovery
No
Exchange The Memory Module
Yes
End
Revise the program by Programmer
Yes
Recovery?
End
No
Load the program
Yes
Recovery?
End
No
To CPU error check flow
CPU error check flow
Exchange Control Module
No
To Control Module check flow chart
Yes
Exchange the Basic Rack Panel
No
Recovery?
Yes
To main check flow
End


Control Module check flow
Check whether the back-up program exists
No
Exist
Yes
Record program and data on cassette tape or floppy diskette, and verify.
Turn OFF power and exchange Control Module. Load the stored program.
Check the details of program and data with sequential drawings of the machines. Check that the instructions are not changed.
No
Match
Yes
Match?
Yes
No
Check whether the stored program is for the operation of the machines
Turn OFF power exchange Control Module. Load the stored program.
Check method contents
No
Right?
Yes
Recovery ?
Yes
Go to the main check flow.
Yes
Drawings are not revised
No
Load the stored program to another PC and verify with CPU error memory, and sequential flow chart.
End
Re-write the program to normal command.
Yes
Any abnormal commands
No
Yes
Possible?
No
Exchange Control Module and correct the program
Recovery?
Yes
After exchanging Control Module, load stored program or get resemble machine's program and revise. Input the program from the sequential drawings, if no program is got for reference.
End
Go to the main check flow.
Recovery?
No
Go to the main check flow
Yes
End


I/O error check flow
Monitor #160
In case of "60(H)," "61(H),"
To table table check flow
In case of "70(H)," "71(H)," "72(H)," "73(H),"
To table registration check flow
In case of "40(H)," "42(H),"
In case of "44(H)," "48(H),"
Monitor #046
#046(in hexadecimal)
Rack No.
Slot No.
Is Module of #046 installed address firmly fixed
Is I/O Expansion Cable firmly fixed
Is I/O Expansion Cable firmly connected
(When using Expansion Rack Panel)
(When using an Expansion Rack Panel)
Exchange the #046 address installed Module
Exchange Control Module.
Yes
Recover
End
No
Exchange Rack Panel
Yes
Recover
End
No
Exchange I/O Expansion Cable
Yes
Recover
End
No
Exchange Memory Module
Yes
Recover
End
No
To Control Module check flow



After removing causes, re-register the I/O table.

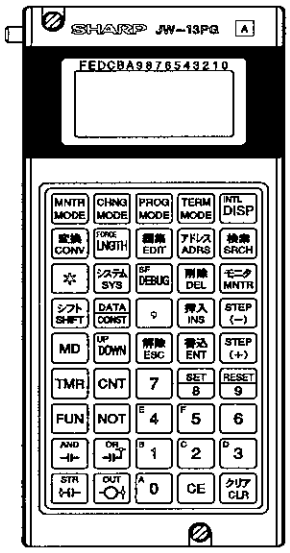


Note 1 Included the case in which I/O Table has not yet registered.

Note 2 When the module installing condition is not changed, or "60(H)" is stored, do not register the I/O table until abnormal causes have been remedied.
Otherwise, the I/O table is registered under present installed conditions, and causes of error until Note 2 are erased.

Chapter 10. How to Use Support Tools

10-1 Programmer : JW-11PG/12PG/13PG



Main functions
• Mnemonics programming • Monitoring • Changing the setting value and current value etc. • I/O table registration • Transferring programs and data in cassette tape • Checking programs • Registration of symbols

■ Connection with control module

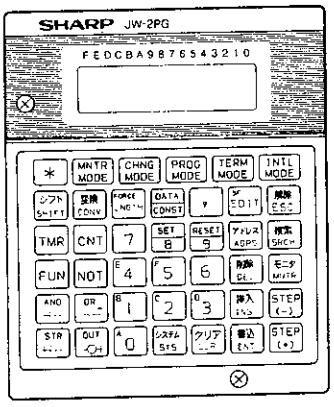
Connect support tool connector of control module : JW-21CU/22CU with a support tool connector of JW-11PG/12PG/13PG using connection cable : JW-22KC/24KC (supplied separately).

Note: Be sure to use only connection cable : JW-22KC/24KC.

■ Cautions for use

1. All the functions of the JW20H are available for use.
2. For the operation method, see the instruction manual attached to the JW-11PG/12PG/13PG.

10-2 Programmer : JW-2PG



Main functions
• Mnemonics programming • Step-flow programming • Monitoring • I/O table registration • Transferring programs and data in cassette tape • Checking programs

■ Connection with control module

Connect support tool connector of control module : JW-21CU/22CU with a support tool connector of JW-2PG using connection cable : JW-22KC (supplied separately). (Direct connection also available.)

Note: Be sure to use only connection cable : JW-22KC/24KC.

■ Cautions for use

For the operation method, see the instruction manual attached to the JW-2PG.

10-3. Ladder Software : JW-50SP

This software is used with personal computers compatible with IBM PC/AT (alias DOS/V) (hereinafter referred to as personal computer) for progam editing, monitoring etc. of a programmable controller.

■ Main functions

- Ladder programming
- Mnemonics programming
- Monitoring
- FD transfer
- Printing

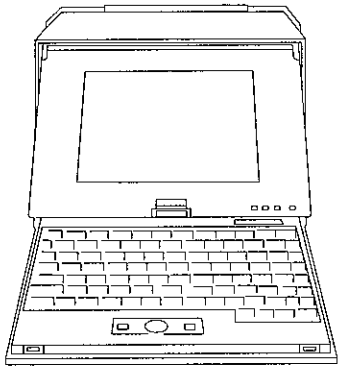
■ Connection with control module

Connect support tool connector of control module with personal computer using connection cable : JW-22KC/24KC (supplied separately) and communication adapter attached to the JW-50SP.

■ Cautions for use

For the operation method, see the instruction manual attached to the JW-50SP.

10-4. Multi-purpose Programmer : JW-50PG



Main functions
• Ladder programming • Mnemonics programming • Monitoring • PC transfer • FD transfer • Printing

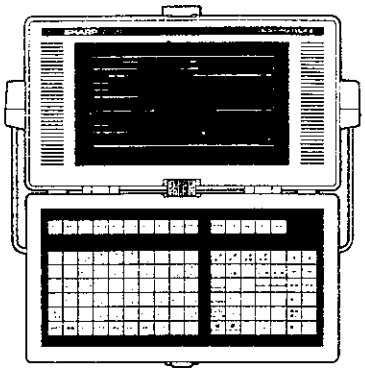
■ Connection with control module

Connect support tool connector of control module : JW-21CU/22CU with COM2 connector of JW-50PG (RS-485) using connection cable : JW-22KC/24KC (supplied separately).

■ Cautions for use

For the operation method, see the instruction manual attached to the JW-50PG.

10-5. Ladder Processor II : Z-100LP2F



Z-100LP2F is installed in expansion module : Z-3LP2ES compatible with JW20H.

Main functions
• Ladder programming • Mnemonics programming • Monitoring • ON-line transfer • I/O table registration • Transferring to cassette and floppy diskette • Printing • Editing

■ Connection with control module

Connect support tool connector of control module : JW-21CU/22CU with RS-422 connector of Z-100LP2F using connection cable : JW-22KC/24KC (supplied separately).

Note: Be sure to use only connection cable : JW-22KC/24KC.

■ Cautions for use

1. Install the expansion module : Z-3LP2ES in Z-100LP2F.
2. PC model setting of Z-100LP2F is as JW21 or JW22.
3. For the operation method, see the instruction manual attached to the Z-100LP2F.
4. Follow the process below for the registration of I/O table.

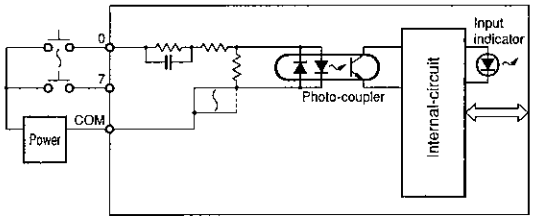
Read out the system memory #024	→	Write 6F in hexadecimal or 111 in decimal	→	Transfer to PC

5. For setting parameters of the special/option module use "register of file 1". For the setting method, see the instruction manual attached to the special/option module.
6. Individual instruction of the JW20H such as F-34 and F-35, do not appear correctly in the display by monitoring.
7. When the JW20H receives instructions (F-72, F-73 etc.) which are not supported by JW20H, operation error occurs and displayed is incorrect.
8. Be aware of the following items, when the memory size of the control module is 3.5k words:
   - Programming over 3.5k words (00000 to 06777) is not available.
   - Transferred program exceeding 3.5k words becomes invalid in the control module.
   - When program mis-matching error appears in ON-line programming by Z-100LP2F, transfer to PC again, match the program in the control module with those of the Z-100LP2F.

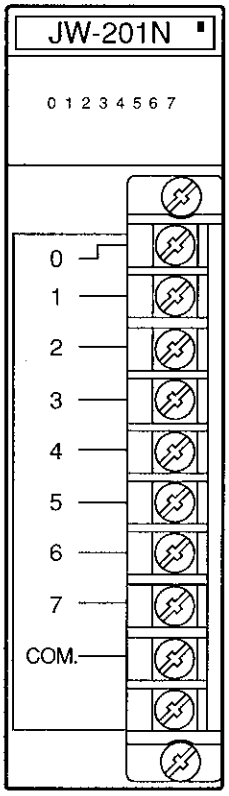
Appendix

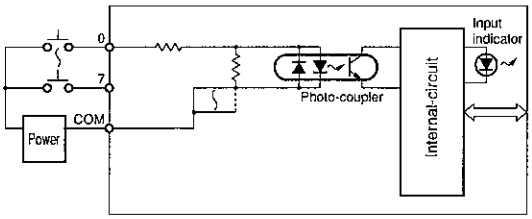
1. Table of I/O module specification

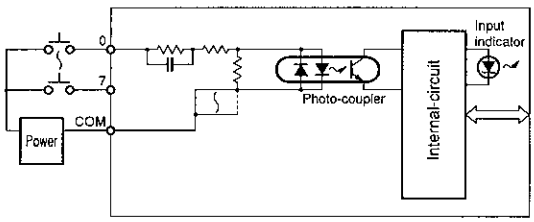
■ Input module

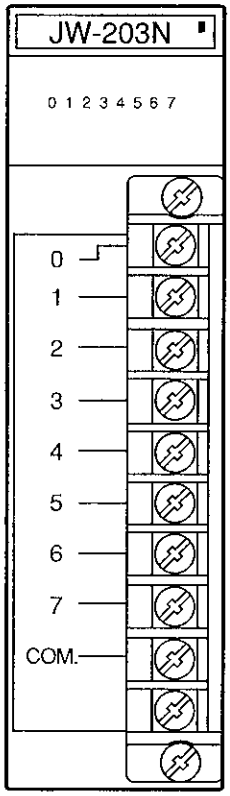
Model name	AC input module : JW-201N
No. of input	8 points
Rated input voltage	100 to 120 VAC (50/60Hz)
Input voltage range	85 to 132 VAC (50/60Hz, waveform distortion : 5% or less)
Rated input current	10 mA TYP. (100 VAC, 60Hz) 8.4 mA TYP. (100 VAC, 50Hz)
Input impedance	10 k ohm (TYP., 60Hz), 12k ohm (TYP, 50Hz)
Surge current	Max. 480 mA, 0.2 ms (at 132 VAC peak ON)
Input ON level	80 V/7 mA or less
Input OFF level	30 V/3 mA or more
Response time (module alone)	OFF to ON : 30 ms or less (100 VAC) ON to OFF : 40 ms or less (100 VAC)
Internal current consumption (5 VDC)	40 mA max.
Operation indication	LED lights at ON condition
External wire connection system	10 P detachable terminal block (M3.5 × 7 screws, blue)
Dielectrical strength	1500 VAC for 1 minute (between input terminal and secondary circuit)
Insulation resistance	500 VDC, 10 M ohm or more (between input terminal and secondary circuit)
Insulation system	By photo-coupler
Common system	1 common line for 8 points
Weight	Approx. 180g
Circuit diagram	

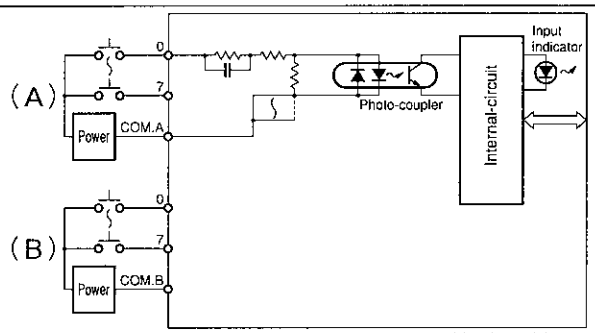
Front view

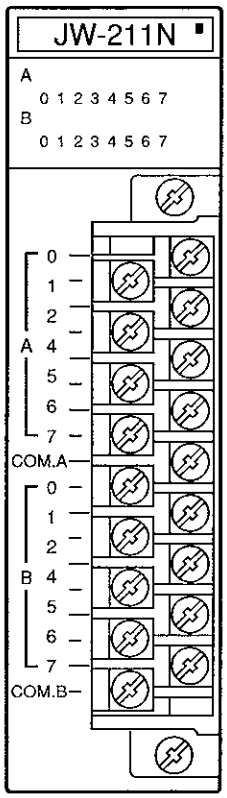


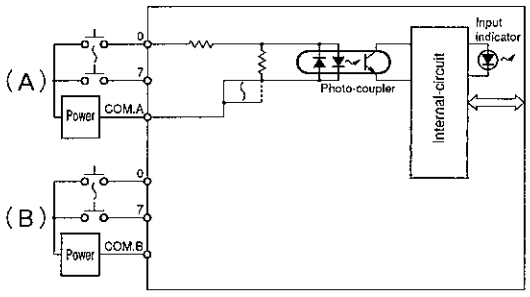
Model name	DC input module (low speed type) : JW-202N	Front view
No. of input	8 points	
Rated input voltage	12/24 VDC	
Input voltage range	10.5 to 26.4 VDC (ripple rate at 24 VDC : 15% or less) (ripple rate at 12 VDC: 5% or less)	
Rated input current	7.5 mA TYP. (24 VDC) 3.5 mA TYP. (12 VDC)	
Input impedance	3.5 k ohm TYP	
Surge current	———	
Input ON level	10.5 V/3 mA or less	
Input OFF level	5 V/1.5 mA or more	
Response time (module alone)	OFF to ON : 10 ms or less (12/24 VDC) ON to OFF : 10 ms or less (12/24 VDC)	
Internal current consumption (5 VDC)	40 mA max.	
Operation indication	LED lights at ON condition	
External wire connection system	10 P detachable terminal block (M3.5 × 7 screws, blue)	
Dielectrical strength	1000 VAC for 1 minute (between input terminal and secondary circuit)	
Insulation resistance	500 VDC, 10 M ohm or more (between input terminal and secondary circuit)	
Insulation system	By photo-coupler	
Common system	1 common line for 8 points (No polarity)	
Weight	Approx. 170g	
Circuit diagram		

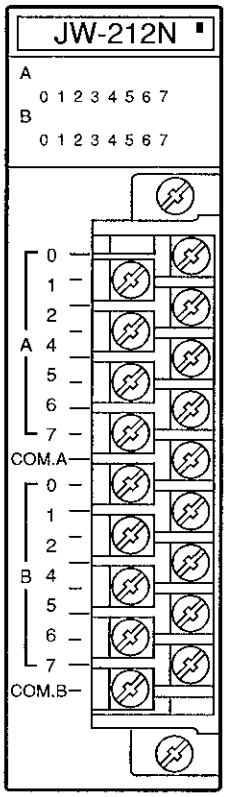
Model name	AC input module : JW-203N	Front view
No. of input	8 points	
Rated input voltage	200 to 240 VAC (50/60 Hz)	
Input voltage range	170 to 250 VAC (50/60 Hz, waveform distortion : 5% or less)	
Rated input current	9.1 mA TYP. (200 VAC, 60 Hz) 8 mA TYP. (200 VAC, 50 Hz)	
Input impedance	22 k ohm (TYP., 60Hz), 25k ohm (TYP, 50 Hz)	
Surge current	Max. 500 mA, 0.2 ms (at 250 VAC peak ON)	
Input ON level	170 V/7 mA or less	
Input OFF level	70 V/3 mA or more	
Response time (module alone)	OFF to ON : 30 ms or less (200 VAC) ON to OFF : 40 ms or less (200 VAC)	
Internal current consumption (5 VDC)	40 mA max.	
Operation indication	LED lights at ON condition	
External wire connection system	10 P detachable terminal block (M3.5 × 7 screws, blue)	
Dielectrical strength	1500 VAC for 1 minute (between input terminal and secondary circuit)	
Insulation resistance	500 VDC, 10 M ohm or more (between input terminal and secondary circuit)	
Insulation system	By photo-coupler	
Common system	1 common line for 8 points	
Weight	Approx. 180g	
Circuit diagram		

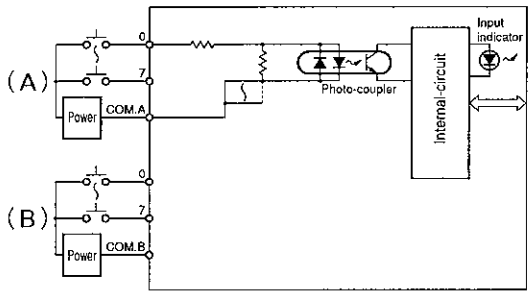


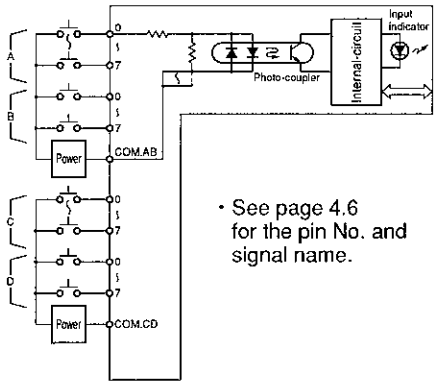
Model name	AC input module : JW-211N	Front view
No. of input	16 points	
Rated input voltage	100 to 120 VAC (50/60 Hz)	
Input voltage range	85 to 132 VAC (50/60 Hz, waveform distortion : 5% or less)	
Rated input current	10 mA TYP. (100 VAC, 60 Hz) 8.4 mA TYP. (100 VAC, 50 Hz)	
Input impedance	10 k ohm (TYP., 60Hz), 12k ohm (TYP, 50 Hz)	
Surge current	Max. 480 mA, 0.2 ms (at 132 VAC peak)	
Input ON level	80 V/7 mA or less	
Input OFF level	30 V/3 mA or more	
Response time (module alone)	OFF to ON : 30 ms or less (100 VAC) ON to OFF : 40 ms or less (100 VAC)	
Internal current consumption (5 VDC)	60 mA max.	
Operation indication	LED lights at ON condition	
External wire connection system	10 P detachable terminal block (M3.5 × 7 screws, blue)	
Dielectrical strength	1500 VAC for 1 minute (between input terminal and secondary circuit)	
Insulation resistance	500 VDC, 10 M ohm or more (between input terminal and secondary circuit)	
Insulation system	By photo-coupler	
Common system	1 common line for 8 points	
Weight	Approx. 220g	
Circuit diagram		



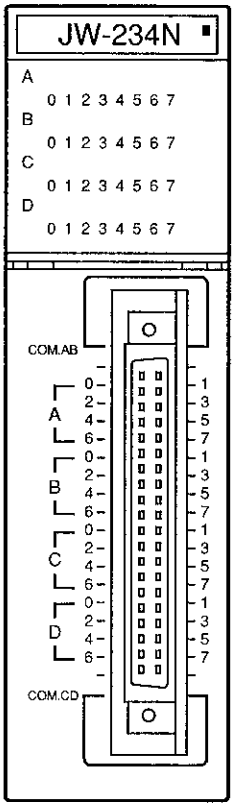
Model name	DC input module : JW-212N	Front view
No. of input	16 points	
Rated input voltage	12/24 VDC	
Input voltage range	10.5 to 26.4 VDC (ripple rate at 24 VDC : 15% or less) (ripple rate at 12 VDC : 5% or less)	
Rated input current	7.5 mA TYP. (24 VDC) 3.5 mA TYP. (12 VDC)	
Input impedance	3.3 k ohm TYP	
Surge current	——	
Input ON level	10.5 V/3 mA or less	
Input OFF level	5 V/1.5 mA or more	
Response time (module alone)	OFF to ON : 10 ms or less (12/24 VDC) ON to OFF : 10 ms or less (12/24 VDC)	
Internal current consumption (5 VDC)	60 mA max.	
Operation indication	LED lights at ON condition	
External wire connection system	18 P detachable terminal block (M3.5 × 7 screws, blue)	
Dielectrical strength	1000 VAC for 1 minute (between input terminal and secondary circuit)	
Insulation resistance	500 VDC, 10 M ohm or more (between input terminal and secondary circuit)	
Insulation system	By photo-coupler	
Common system	1 common line for 8 points (no polarity)	
Weight	Approx. 210g	
Circuit diagram		



Model name	DC input module(high speed type) : JW-214N	Front view
No. of input	16 points	
Rated input voltage	12/24 VDC	
Input voltage range	10.5 to 26.4 VDC (ripple rate at 24 VDC : 15% or less) (ripple rate at 12 VDC : 5% or less)	
Rated input current	7.5 mA TYP. (24 VDC) 3.5 mA TYP. (12 VDC)	
Input impedance	3.3 k ohm TYP	
Surge current	———	
Input ON level	10.5 V/3 mA or less	
Input OFF level	5 V/1.5 mA or more	
Response time (module alone)	OFF to ON : 0.5 ms or less (12/24 VDC) ON to OFF : 1.5 ms or less (12/24 VDC)	
Internal current consumption (5 VDC)	60 mA max.	
Operation indication	LED lights at ON condition	
External wire connection system	18 P detachable terminal block (M3.5 × 7 screws, blue)	
Dielectrical strength	1000 VAC for 1 minute (between input terminal and secondary circuit)	
Insulation resistance	500 VDC, 10 M ohm or more (between input terminal and secondary circuit)	
Insulation system	By photo-coupler	
Common system	1 common line for 8 points (no polarity)	
Weight	Approx. 210g	
Circuit diagram		

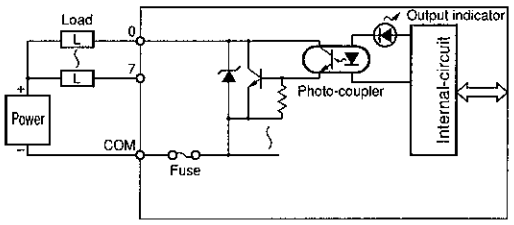
Model name	DC input module : JW-234N
No. of input	32 points *
Rated input voltage	12/24 VDC
Input voltage range	10.5 to 26.4 VDC (ripple rate at 24 VDC : 15% or less) (ripple rate at 12 VDC : 5% or less)
Rated input current	7 mA TYP. (24 VDC) 3.5 mA TYP. (12 VDC)
Input impedance	3.5 k ohm TYP
Surge current	———
Input ON level	10.5 V/3 mA or less
Input OFF level	5 V/1.5 mA or more
Response time (module alone)	OFF to ON : 0.5 ms or less (12/24 VDC) ON to OFF : 1.5 ms or less (12/24 VDC)
Internal current consumption (5 VDC)	80 mA max.
Operation indication	LED lights at ON condition
External wire connection system	40 P connector (soldering) Applicable wire size : AW22 to 24 (0.3 to 0.13 mm^2)
Dielectrical strength	1000 VAC for 1 minute (between input terminal and secondary circuit)
Insulation resistance	500 VDC, 10 M ohm or more (between input terminal and secondary circuit)
Insulation system	By photo-coupler
Common system	1 common line for 16 points (no polarity)
Weight	Approx. 410g
Circuit diagram	 • See page 4.6 for the pin No. and signal name.
Accessories	40 P connector (soldering) × 1

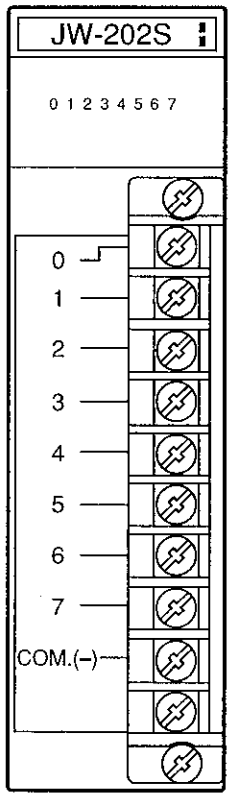
Front view



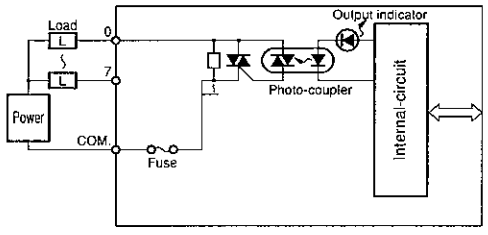
* When using at ambient temperature of 45 to 55°C in 24 VDC, use that same time input ON no. of points should be less than 10 points per common. However, constraint do not have in case of using for 12 VDC.

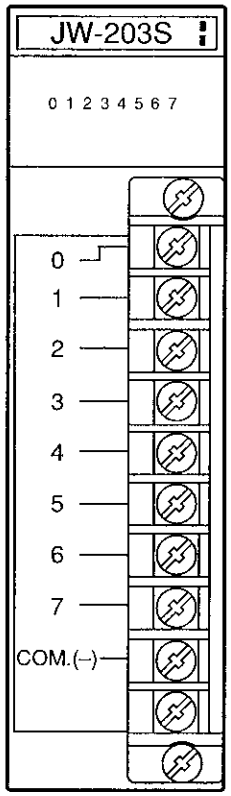
■Output module

Model name	DC output module (sink output) : JW-202S	Front view
No. of output	8 points	
Rated load voltage	5/12/24 VDC	
Load voltage range	4.75 to 27 VDC	
Rated max. load current	1 A/point, 4 A/common *	
Allowable surge current	4 A (100 ms)	
Min. load current	———	
OFF leak current	0.2 mA or less	
ON voltage drop	1.4 V or less (1 A)	
Response time (module alone)	OFF to ON : 1 ms or less (resistance load) ON to OFF : 1 ms or less (resistance load)	
Surge killer	Zener diode	
Rated capacity of fuse element	4 A/125 V (one per common) Using fuse : 125 VAC 4 A (MQ2 4 A [SOC])	
Internal current consumption (5 VDC)	190 mA max.	
Operation indication	LED lights at ON condition	
External wire connection system	10 P detachable terminal block, (M 3.5 × 7 screws, red)	
Dielectrical strength	1000 VAC for 1 minute (between output terminal and secondary circuit)	
Insulation resistance	500 VDC, 10 M ohm or more (between output terminal and secondary circuit)	
Insulation system	By photo-coupler	
Common system	1 common line for 8 points (no polarity)	
Weight	Approx. 180g	
Circuit diagram		
Accessories	Fuse element 125 VAC 4A × 1	



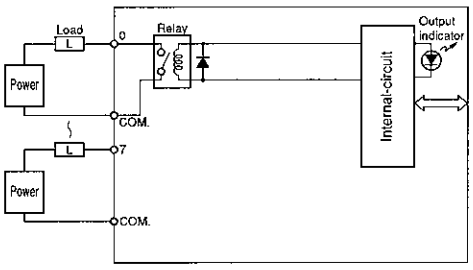
* When the module receives more than 0.3 A inductive load, use the module less than 30 times/minute open-close frequency (approx. ON for 1 sec., OFF for 1 sec). When the module receives more than 0.5 A of load current, be sure to install surge absorbing measures at load side.

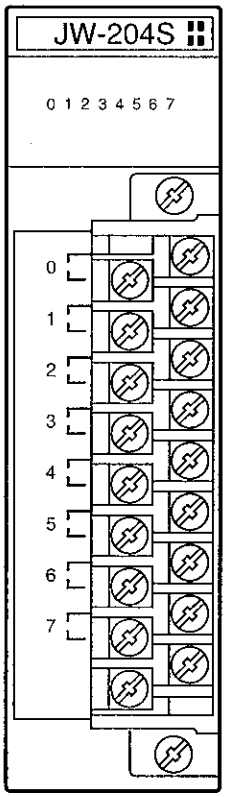
Model name	AC output module : JW-203S	Front view
No. of output	8 points	
Rated load voltage	100 to 240 VAC (50/60Hz)	
Load voltage range	15 to 250 VAC (50/60 Hz, waveform distortion: less than 5%)	
Rated max. load current	1 A/point, 4 A/common *1	
Allowable surge current	8 A (100 ms)	
Min. load current	30 mA *2	
OFF leak current	1.5 mA or less (120 VAC, 25°C), 3 mA or less (240 VAC, 25°C)	
ON voltage drop	1.6 V or less (at 1 A)	
Response time (module alone)	OFF to ON : 1 ms or less ON to OFF : 1 ms plus half power frequency or less	
Surge killer	Capacitive varistor, snubber	
Rated capacity of fuse element	4 A/125 V (one per common) Using fuse : 250 VAC 4 A (SS2 4 A [SOC])	
Internal current consumption (5 VDC)	130 mA max.	
Operation indication	LED lights at ON condition	
External wire connection system	10 P detachable terminal block, (M 3.5 × 7 screws, red)	
Dielectrical strength	1500 VAC for 1 minute (between output terminal and secondary circuit)	
Insulation resistance	500 VDC, 10 M ohm or more (between output terminal and secondary circuit)	
Insulation system	By photo-coupler	
Common system	1 common line for 8 points	
Weight	Approx. 220g	
Circuit diagram		
Accessories	Fuse element : 125 VAC 4A × 1	

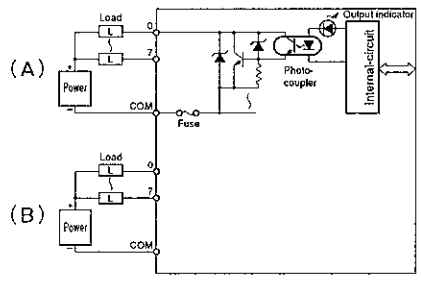


*1 When ambient temperature is more than 50°C, make sure that load current should be less than 0.8 A/point and 3.2 A/common.

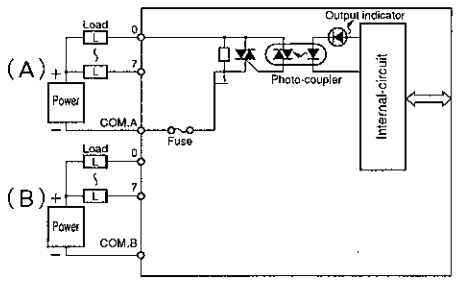
*2 When load current at hold is less than 30 mA, the module may not be able to be switched OFF in certain load situations. In these cases, connect a bleeder parallel to the load line to increase the load current to more than 30 mA level.

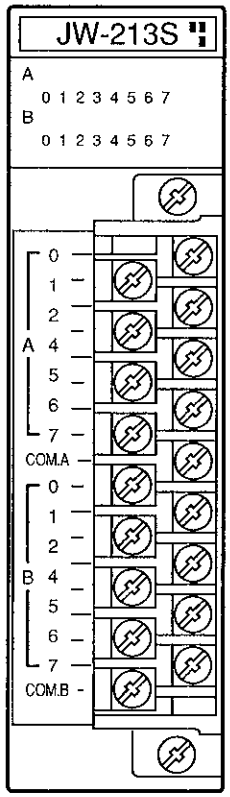
Model name		Relay output module (separated common) : JW-204S	Front view
No. of output		8 points	
Max. open-close voltage and current		250 VAC/30 VDC, 2A/point (resistance load)	
Min. load		5 VDC, 10 mA	
Ope-ration life	Mechanical	20,000,000 times or more	
	Electrial	1. Max. open-close voltage and current load : 100,000 times or more 2. Inductive load (250 VAC, 0.5 A (COS ϕ = 0.4)) : 200,000 times or more 3. Inductive load (30 VDC, 0.5 A (T = 7 ms)) : 20,0000 times or more	
Response time (module alone)		OFF to ON : 10 ms or less ON to OFF : 10 ms or less	
Surge killer		———	
Rated capacity of fuse element		———	
Internal current consumption (5 VDC)		430 mA max.	
Operation indication		LED lights at ON condition	
External wire connection system		18 P detachable terminal block, (M 3.5 × 7 screws, red)	
Dielectrical strength		1500 VAC for 1 minute (between output terminal and secondary circuit)	
Insulation resistance		500 VDC, 10 M ohm or more (between output terminal and secondary circuit)	
Insulation system		By relay	
Common system		1 common line for 1 point (separated common)	
Weight		Approx. 220g	
Circuit diagram			



Model name	DC output module (sink output) : JW-212S	Front view
No. of output	16 points	
Rated load voltage	5/12/24 VDC	
Load voltage range	4.75 to 27 VDC	
Rated max. load current	0.5 A/point, 2 A/common *	
Allowable surge current	1 A (100 ms)	
Min. load current	———	
OFF leak current	0.2 mA or less	
ON voltage drop	1.2 V or less (0.3 A)	
Response time (module alone)	OFF to ON : 1 ms or less (resistance load) ON to OFF : 1 ms or less (resistance load)	
Surge killer	Zener diode (built-in between C and B of transistor)	
Rated capacity of fuse element	Built-in 3 A fuse (unable replacement)/common	
Internal current consumption (5 VDC)	60 mA max.	
Operation indication	LED lights at ON condition	
External wire connection system	18 P detachable terminal block, (M 3.5 × 7 screws, red)	
Dielectrical strength	1000 VAC for 1 minute (between output terminal and secondary circuit)	
Insulation resistance	500 VDC, 10 M ohm or more (between output terminal and secondary circuit)	
Insulation system	By photo-coupler	
Common system	1 common line for 8 points	
Weight	Approx. 200g	
Circuit diagram		

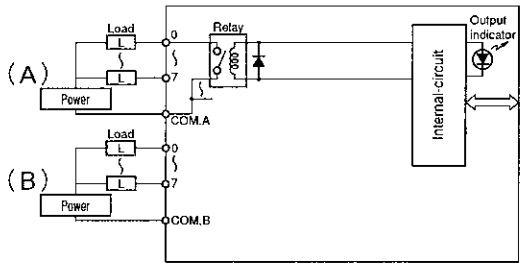
* When load current exceeds 0.3 A, install a diode as surge absorber at load side.

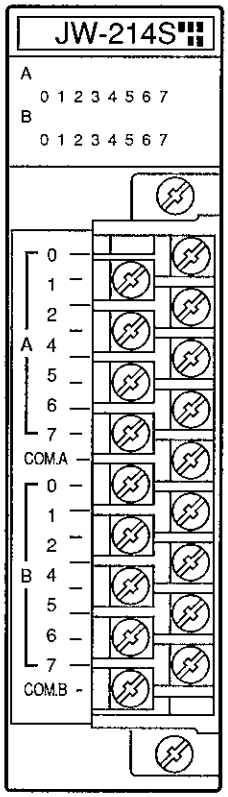
Model name	AC output module : JW-213S	Front view
No. of output	16 points	
Rated load voltage	100 to 240 VAC (50/60Hz)	
Load voltage range	15 to 250 VAC (50/60 Hz, waveform distortion: less than 5%)	
Rated max. load current	0.5 A/point, 2 A/common *1	
Allowable surge current	6 A (100 ms)	
Min. load current	15 mA *2	
OFF leak current	1.5 mA or less (120 VAC, 25°C), 3 mA or less (240 VAC, 25°C)	
ON voltage drop	1.6 V or less (0.3 A)	
Response time (module alone)	OFF to ON : 1 ms or less ON to OFF : 1 ms plus half power frequency or less	
Surge killer	Capacitive varistor	
Rated capacity of fuse element	Built-in 3 A fuse (unable replacemant) / common	
Internal current consumption (5 VDC)	260 mA max.	
Operation indication	LED lights at ON condition	
External wire connection system	18 P detachable terminal block, (M 3.5 × 7 screws, red)	
Dielectrical strength	1500 VAC for 1 minute (between output terminal and secondary circuit)	
Insulation resistance	500 VDC, 10 M ohm or more (between output terminal and secondary circuit)	
Insulation system	By photo-coupler	
Common system	1 common line for 8 points	
Weight	Approx. 210g	
Circuit diagram		

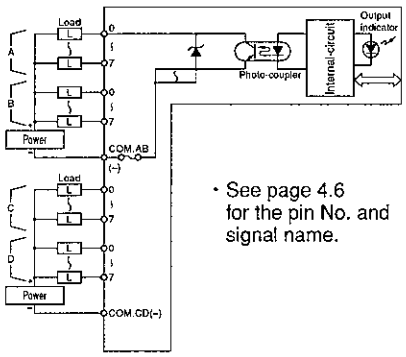


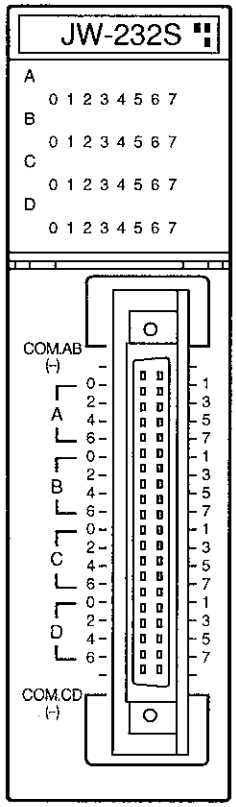
*1 When ambient temperature is more than 45°C, make sure that load current should be less than 0.3 A/point.

*2 When load current at hold is less than 15 mA, the module may not be able to be switched OFF in certain load situations. In these cases, connect a bleeder parallel to the load line to increase the load current to more than 15 mA level.

Model name		Relay output module : JW-214S	Front view
No. of output		16 points	
Max. open-close voltage and current		250 VAC/30 VDC, 2A/points, 5A/common	
Min. load		5 VDC, 10 mA	
Operation life	Mechanical	20,000,000 times or more	
	Electrial	1. Max. open-close voltage and current load : 100,000 times or more 2. Inductive load (250 VAC, 0.5 A (COS ϕ = 0.4)) : 200,000 times or more 3. Inductive load (30 VDC, 0.5 A (T = 7 ms)) : 200,000 times or more	
Response time (module alone)		OFF to ON : 10 ms or less ON to OFF : 10 ms or less	
Surge killer		———	
Rated capacity of fuse element		———	
Internal current consumption (5 VDC)		550 mA max.	
Operation indication		LED lights at ON condition	
External wire connection system		18 P detachable terminal block, (M 3.5 × 7 screws, red)	
Dielectrical strength		1500 VAC for 1 minute (between output terminal and secondary circuit)	
Insulation resistance		500 VDC, 10 M ohm or more (between output terminal and secondary circuit)	
Insulation system		By relay	
Common system		1 common line for 8 points	
Weight		Approx. 240g	
Circuit diagram			



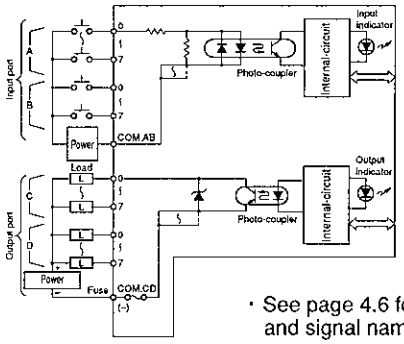
Model name	DC output module (sink output) : JW-232S	Front view
No. of output	32 points	
Rated load voltage	5/12/24 VDC	
Load voltage range	4.75 to 30 VDC	
Rated max. load current	0.1 A/point, 1.6 A/common *	
Allowable surge current	0.15 A (10 ms)	
Min. load current	———	
OFF leak current	0.2 mA or less	
ON voltage drop	1.3 V or less (0.1 A)	
Response time (module alone)	OFF to ON : 1 ms or less ON to OFF : 1 ms or less (with resistance load)	
Surge killer	Zener diode	
Rated capacity of fuse element	Built-in 2 A fuse (unable replacement)/common	
Internal current consumption (5 VDC)	320 mA max.	
Operation indication	LED lights at ON condition	
External wire connection system	40 P connector (soldering) Applicable wire size: AWG22 to 24 (0.3 to 0.13 mm^2)	
Dielectrical strength	1000 VAC for 1 minute (between output terminal and secondary circuit)	
Insulation resistance	500 VDC, 10 M ohm or more (between output terminal and secondary circuit)	
Insulation system	By photo-coupler	
Common system	1 common line for 16 points	
Weight	Approx. 410g	
Circuit diagram	 • See page 4.6 for the pin No. and signal name.	
Accessories	40P connector (soldering) × 1	

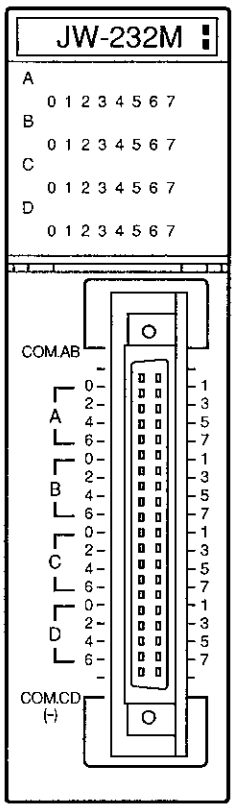


*1 When using at ambient temperature of 45 to 55°C in 24 VDC, use that same time input ON no. of points should be less than 10 points per common.

*2 When using at ambient temperature of 45 to 55°C, use within 1 A per common terminal.

■ I/O module

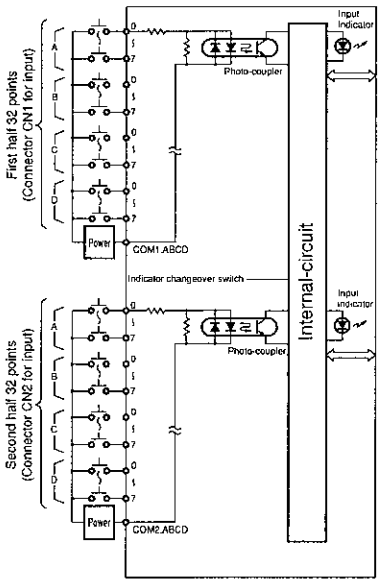
			Front view
	Model name	DC I/O module (sink output) : JW-232M	
Input port	No. of input	16 points *1	
	Rated input voltage	12/24 VDC	
	Input voltage range	10.5 to 26.4 VDC (ripple rate at 24 VDC : 15% or less; ripple rate at 12 VDC : 5% or less)	
	Rated input current	7 mA TYP. (24 VDC), 3.3 mA TYP. (12 VDC)	
	Input impedance	3.5k ohm TYP.	
	Surge current	———	
	Input ON level	10.5 V/3 mA or less	
	Input OFF level	5 V/1.5 mA or more	
	Response time (module alone)	OFF to ON : 0.5 ms or less ON to OFF : 1.5 ms or less	
Output port	No. of output	16 points	
	Rated load voltage	5/12/24 VDC	
	Load voltage range	4.75 to 30 VDC	
	Rated max. load current	0.1 A/point, 1.6 A/common *2	
	Allowable surge current	0.15 A (10 ms)	
	Min. load current	———	
	OFF leak current	0.2 mA or less	
	ON voltage drop	1.3 V or less (0.1 A)	
	Response time (module alone)	OFF to ON : 1 ms or less ON to OFF : 1 ms or less (with resistance load)	
	Surge killer	Zener diode	
	Rated capacity of fuse element	Built-in 2 A fuse (unable replacement)/common	
Internal current consumption (5 VDC)		200 mA max.	
Operation indication		LED lights at ON condition	
External wire connection system		40 P connector (soldering) Applicable wire size: AWG22 to 24 (0.3 to 0.13 mm^2)	
Dielectrical strength		1000 VAC for 1 minute (between I/O terminal and secondary circuit)	
Insulation resistance		500 VDC, 10 M ohm or more (between I/O terminal and secondary circuit)	
Insulation system		By photo-coupler	
Common system		1 common line for 16 points (no polarity for input)	
Weight		Approx. 410g	
Circuit diagram		 · See page 4.6 for pin No. and signal name.	
Accessories		40 P connector (soldering) × 1	



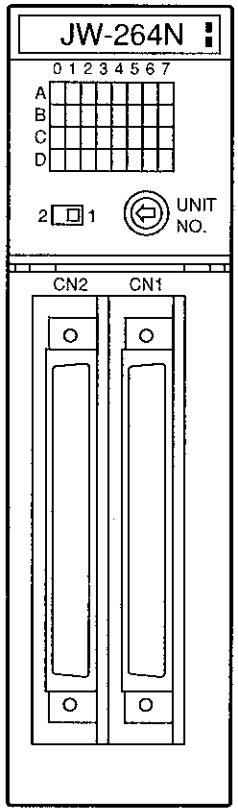
(1) JW-264N

* When using at ambient temperature of 45 to 55°C, use within 1 A per common terminal.

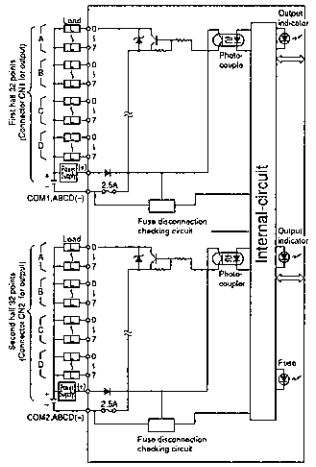
■ Special I/O module

Model name	DC output module : JW-264N
No. of input	64 points (Allocation of the first half 64 points of the relay for special module.) *
Number of I/O occupied points	I/O relay : 16 points (dummy) Relay for special module : 128 points
Rated input voltage	24 VDC
Input voltage range	20 to 26.4 VDC
Rated input current	4.1 mA (24 VDC)
Input impedance	5.9 k ohm
Surge current	———
Input ON level	18 V/3 mA or less
Input OFF level	8 V/1.5 mA or more
Response time (module alone)	OFF to ON : 0.5 ms or less ON to OFF : 1 ms less
Internal current consumption (5 VDC)	60 mA max. (At all points ON for input.)
Operation indication	Indicator lamps at ON condition (The simulataneous indication is 32 points max., first half 32 points and second half 32 points are changed over by the indicator changeover switch.)
External wire connection system	Applicable wire size using connection connector (accessories) : AWG23, 24 (0.26 to 0.20 mm^2)
Dielectrical strength	1000 VAC for 1 minute (between input terminal and secondary circuit)
Insulation resistance	500 VAC, 10M ohm or more (between input terminal and secondary circuit)
Insulation system	By photo-coupler
Common system	1 common line for 32 points (no polarity)
Weight	Approx. 220g
Circuit diagram	
Accessories	40 P connector (soldering) × 2

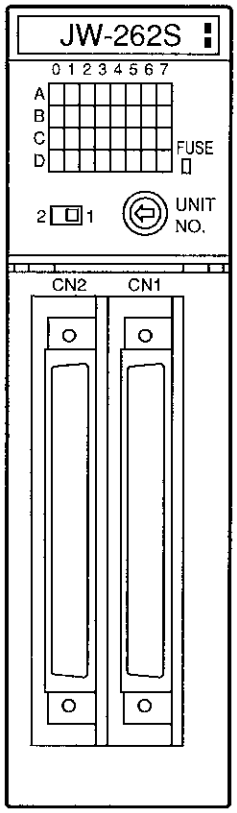
Front view



* When the load power source is 5/12 VDC, the load current per point decreases.

Model name	DC output module (sink output) : JW-262S
No. of output	64 points (Allocation of the first half 64 points of the relay for special module.)
Number of I/O occupied points	I/O relay : 16 points (dummy) Relay for special module: 128 points
Rated load voltage	5/12/24 VDC
Load voltage range	4.75 to 26.4 VDC
Rated max. load current	0.1 A/point, 2 A/common *
Allowable surge current	0.15 A (100 ms)
Min. load current	———
OFF leak current	0.2 mA or less
ON voltage drop	1.2 V or less (0.1A)
Response time (module alone)	OFF to ON : 0.5 ms or less ON to OFF : 1 ms or less (with 0.1A resistance load)
Internal current consumption (5 VDC)	300 mA max. (At all points ON for output.)
Surge killer	Zener diode
Rated capacity of fuse element	Built-in 2.5A fuse (unable replacement). Melt-down detection function is provided. (When melted down or external power source is turned OFF, the LED lights.)
Operation indication	Indicator lamps at ON condition (The simulataneous indication is 32 points max., first half 32 points and second half 32 points are changed over by the indicator changeover switch.)
External energizer	5/12/24 V (200 mA max.) Use same power with load power
External wire connection system	Applicable wire size using connection connector (accessories) : AWG23, 24 (0.26 to 0.20 mm^2)
Dielectrical strength	1000 VAC for 1 minute (between input terminal and secondary circuit)
Insulation resistance	500 VDC, 10M ohm or more (between input terminal and secondary circuit)
Insulation system	By photo-coupler
Common system	1 common line for 32 points (slot common)
Weight	Approx. 220g
Circuit diagram	
Accessories	40 P connector (soldering) × 2

Front view



See page 4.7 for the pin No. of connector and signal name.

Load power	5 VDC	12 VDC	24 VDC
The load current per point	30 mA max.	60mA max.	100 mA max.

Pin No. of connector CN1, CN2 and signal name

CN1 (The first half 32 points)

CN1

Signal name		Pin No.
JW-264N	JW-262S	
COM.1	Power supply 1 (+)	1 A
Vacant	COM.1 (-)	2 A
A — 0		3 A
A — 2		4 A
A — 4		5 A
A — 6		6 A
B — 0		7 A
B — 2		8 A
B — 4		9 A
B — 6		10 A
C — 0		11 A
C — 2		12 A
C — 4		13 A
C — 6		14 A
D — 0		15 A
D — 2		16 A
D — 4		17 A
D — 6		18 A
Vacant	COM.1 (-)	19 A
COM.1	Power supply 1 (+)	20 A

Pin No.	Signal name	
	JW-264N	JW-262S
1 B	COM.1	Power supply 1 (+)
2 B	Vacant	COM.1 (-)
3 B	A — 1	
4 B	A — 3	
5 B	A — 5	
6 B	A — 7	
7 B	B — 1	
8 B	B — 3	
9 B	B — 5	
10 B	B — 7	
11 B	C — 1	
12 B	C — 3	
13 B	C — 5	
14 B	C — 7	
15 B	D — 1	
16 B	D — 3	
17 B	D — 5	
18 B	D — 7	
19 B	Vacant	COM.1 (-)
20 B	COM.1	Power supply 1 (+)

- Pin number 1A and 20A, and 1B and 20B of JW-264N are respectively connected inside.
- Pin number 1A and 19A, 2A and 20A, 1B and 19B, and 2B and 20B of JW-262S are respectively connected insides.

CN2 (The second half 32 points)

CN2

Signal name		Pin No.
JW-264N	JW-262S	
COM.2	Power supply 2 (+)	1 A
Vacant	COM.2 (-)	2 A
A — 0		3 A
A — 2		4 A
A — 4		5 A
A — 6		6 A
B — 0		7 A
B — 2		8 A
B — 4		9 A
B — 6		10 A
C — 0		11 A
C — 2		12 A
C — 4		13 A
C — 6		14 A
D — 0		15 A
D — 2		16 A
D — 4		17 A
D — 6		18 A
Vacant	COM.2 (-)	19 A
COM.2	Power supply 2 (+)	20 A

Pin No.	Signal name	
	JW-264N	JW-262S
1 B	COM.2	Power supply 2 (+)
2 B	Vacant	COM.2 (-)
3 B	A — 1	
4 B	A — 3	
5 B	A — 5	
6 B	A — 7	
7 B	B — 1	
8 B	B — 3	
9 B	B — 5	
10 B	B — 7	
11 B	C — 1	
12 B	C — 3	
13 B	C — 5	
14 B	C — 7	
15 B	D — 1	
16 B	D — 3	
17 B	D — 5	
18 B	D — 7	
19 B	Vacant	COM.2 (-)
20 B	COM.2	Power supply 2 (+)

- Pin number 1A and 20A, and 1B and 20B of JW-264N are respectively connected inside.
- Pin number 1A and 19A, 2A and 20A, 1B and 19B, and 2B and 20B of JW-262S are respectively connected insides.

· Allocation of relay No.

The relay number of JW-264N/262S is allocated by setting the module No. switch as same as JW20H special I/O module. Set at delivery of module No. swicth is 0.

Module No. switch	Byte address allocated by JW-264N/262S
0	□0200 to 0217 (□0120 to 0217 is dummy area)
1	□0220 to 0237 (□0230 to 0237 is dummy area)
2	□0240 to 0257 (□0250 to 0257 is dummy area)
3	□0260 to 0277 (□0270 to 0277 is dummy area)
4	□0300 to 0317 (□0310 to 0317 is dummy area)
5	□0320 to 0337 (□0330 to 0337 is dummy area)
6	□0340 to 0357 (□0350 to 0357 is dummy area)
7	□0360 to 0377 (□0370 to 0377 is dummy area)

The relation between JW-264N/262S connector CN1/CN2 (pin No.) and relay No.

	Pin No.	* S/G	Setting value of module No. switch 0	1	2	3	4	5	6	7
Connector CN1(The first half 32 points)	3A	A-0	02000	02200	02400	02600	03000	03200	03400	03600
	3B	A-1	02001	02201	02401	02601	03001	03201	03401	03601
	4A	A-2	02002	02202	02402	02602	03002	03202	03402	03602
	4B	A-3	02003	02203	02403	02603	03003	03203	03403	03603
	5A	A-4	02004	02204	02404	02604	03004	03204	03404	03604
	5B	A-5	02005	02205	02405	02605	03005	03205	03405	03605
	6A	A-6	02006	02206	02406	02606	03006	03206	03406	03606
	6B	A-7	02007	02207	02407	02607	03007	03207	03407	03607
	7A	B-0	02010	02210	02410	02610	03010	03210	03410	03610
	7B	B-1	02011	02211	02411	02611	03011	03211	03411	03611
	8A	B-2	02012	02212	02412	02612	03012	03212	03412	03612
	8B	B-3	02013	02213	02413	02613	03013	03213	03413	03613
	9A	B-4	02014	02214	02414	02614	03014	03214	03414	03614
	9B	B-5	02015	02215	02415	02615	03015	03215	03415	03615
	10A	B-6	02016	02216	02416	02616	03016	03216	03416	03616
	10B	B-7	02017	02217	02417	02617	03017	03217	03417	03617
	11A	C-0	02020	02220	02420	02620	03020	03220	03420	03620
	11B	C-1	02021	02221	02421	02621	03021	03221	03421	03621
	12A	C-2	02022	02222	02422	02622	03022	03222	03422	03622
	12B	C-3	02023	02223	02423	02623	03023	03223	03423	03623
	13A	C-4	02024	02224	02424	02624	03024	03224	03424	03624
	13B	C-5	02025	02225	02425	02625	03025	03225	03425	03625
	14A	C-6	02026	02226	02426	02626	03026	03226	03426	03626
	14B	C-7	02027	02227	02427	02627	03027	03227	03427	03627
	15A	D-0	02030	02230	02430	02630	03030	03230	03430	03630
	15B	D-1	02031	02231	02431	02631	03031	03231	03431	03631
	16A	D-2	02032	02232	02432	02632	03032	03232	03432	03632
	16B	D-3	02033	02233	02433	02633	03033	03233	03433	03633
	17A	D-4	02034	02234	02434	02634	03034	03234	03434	03634
	17B	D-5	02035	02235	02435	02635	03035	03235	03435	03635
	18A	D-6	02036	02236	02436	02636	03036	03236	03436	03636
	18B	D-7	02037	02237	02437	02637	03037	03237	03437	03637

	Pin No.	* S/G	Setting value of module No. switch 0	1	2	3	4	5	6	7
Connector CN2(The second half 32 points)	3A	A-0	02040	02240	02440	02640	03040	03240	03440	03640
	3B	A-1	02041	02241	02441	02641	03041	03241	03441	03641
	4A	A-2	02042	02242	02442	02642	03042	03242	03442	03642
	4B	A-3	02043	02243	02443	02643	03043	03243	03443	03643
	5A	A-4	02044	02244	02444	02644	03044	03244	03444	03644
	5B	A-5	02045	02245	02445	02645	03045	03245	03445	03645
	6A	A-6	02046	02246	02446	02646	03046	03246	03446	03646
	6B	A-7	02047	02247	02447	02647	03047	03247	03447	03647
	7A	B-0	02050	02250	02450	02650	03050	03250	03450	03650
	7B	B-1	02051	02251	02451	02651	03051	03251	03451	03651
	8A	B-2	02052	02252	02452	02652	03052	03252	03452	03652
	8B	B-3	02053	02253	02453	02653	03053	03253	03453	03653
	9A	B-4	02054	02254	02454	02654	03054	03254	03454	03654
	9B	B-5	02055	02255	02455	02655	03055	03255	03455	03655
	10A	B-6	02056	02256	02456	02656	03056	03256	03456	03656
	10B	B-7	02057	02257	02457	02657	03057	03257	03457	03657
	11A	C-0	02060	02260	02460	02660	03060	03260	03460	03660
	11B	C-1	02061	02261	02461	02661	03061	03261	03461	03661
	12A	C-2	02062	02262	02462	02662	03062	03262	03462	03662
	12B	C-3	02063	02263	02463	02663	03063	03263	03463	03663
	13A	C-4	02064	02264	02464	02664	03064	03264	03464	03664
	13B	C-5	02065	02265	02465	02665	03065	03265	03465	03665
	14A	C-6	02066	02266	02466	02666	03066	03266	03466	03666
	14B	C-7	02067	02267	02467	02667	03067	03267	03467	03667
	15A	D-0	02070	02270	02470	02670	03070	03270	03470	03670
	15B	D-1	02071	02271	02471	02671	03071	03271	03471	03671
	16A	D-2	02072	02272	02472	02672	03072	03272	03472	03672
	16B	D-3	02073	02273	02473	02673	03073	03273	03473	03673
	17A	D-4	02074	02274	02474	02674	03074	03274	03474	03674
	17B	D-5	02075	02275	02475	02675	03075	03275	03475	03675
	18A	D-6	02076	02276	02476	02676	03076	03276	03476	03676
	18B	D-7	02077	02277	02477	02677	03077	03277	03477	03677

*Signal name

2. Accessories

[1] Control module

Instrution manual	1

[2] Memory module

Battery-less connector	1

[3] Expansion rack panel

Side board for I/O module	1

[4] I/O expansion cable

• JW-203EC	
5VDC cable (30 cm)	1
• JW-207EC	
5VDC cable (70 cm)	1
• JW-22EC	
5VDC cable (2 m)	1
Short connector	1
• JW-25EC/210EC	
Short connector	1

[5] Input module

• JW-234N	
Connection connector	1

[6] Output module

• JW-202S	
125VAC 4A fuse element	1
• JW-203S	
125VAC 4A fuse element	1
• JW-232S	
Connetion connector	1

[7] I/O module

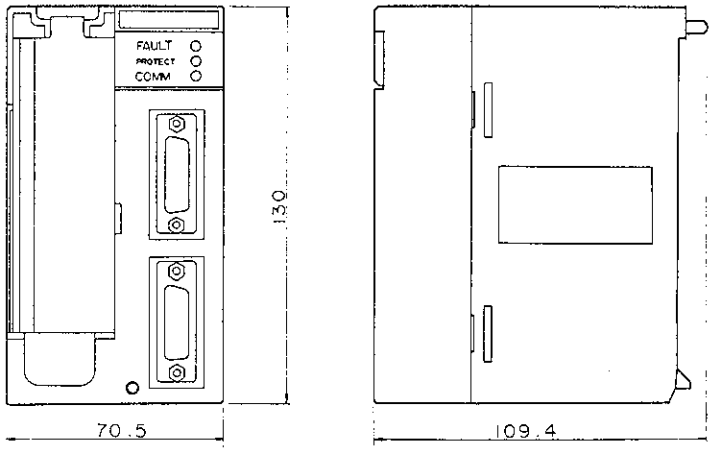
• JW-232M	
Connection connector	1

[8] Special I/O module

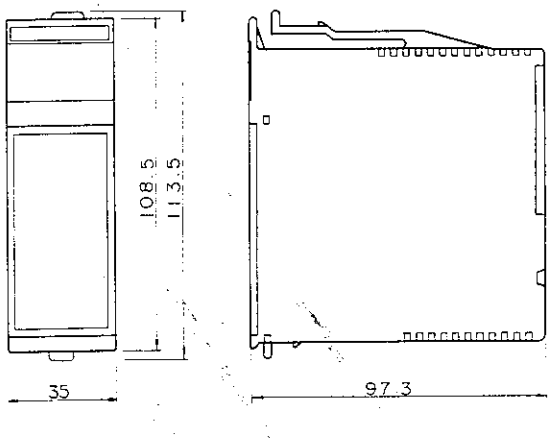
• JW-264N	
Connection connector	2
• JW-262S	
Connection connector	2

3. Outline dimension drawings (unit: mm)

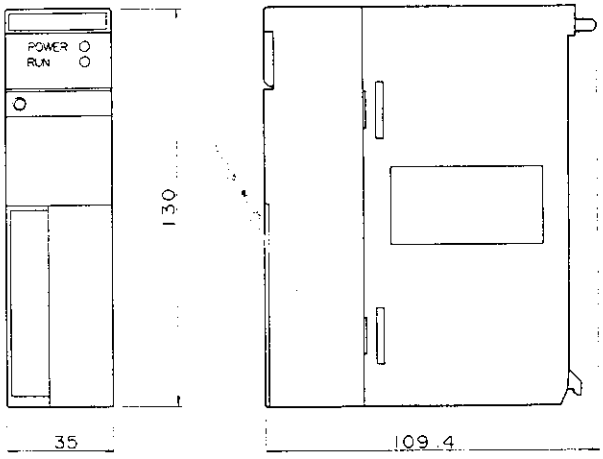
[1] Control module (The same dimension for JW-21CU and JW-22CU)



[2] Memory module (The same dimension for JW-21MA, JW-22MA, JW-21MO, and JW-21ME)

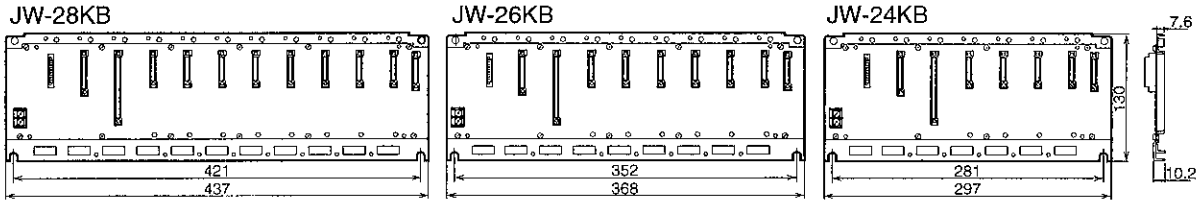


[3] Power supply module (The same dimension for JW-21PU, JW-22PU, and JW-31PU)

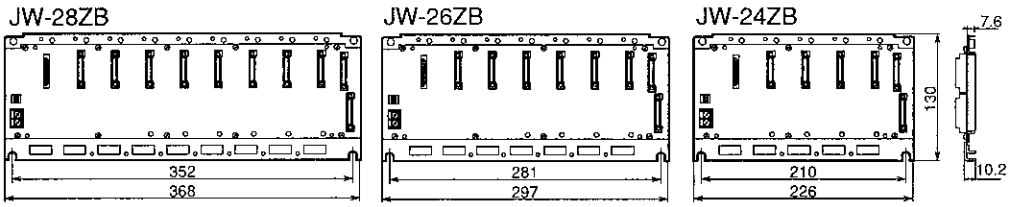


[4] Basic/expansion rack panel

• Basic rack panel

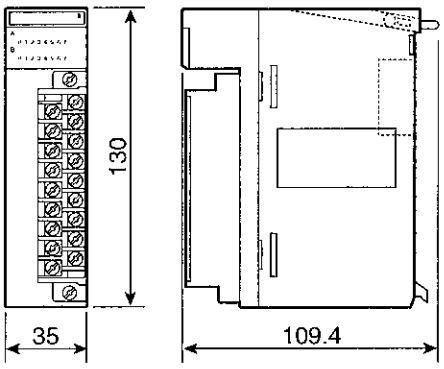


• Expansion rack panel

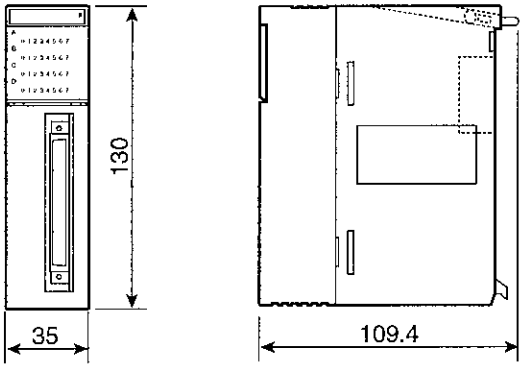


[5] I/O module

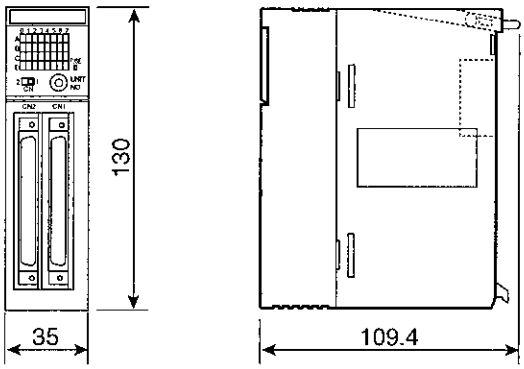
• 8/16-point module



• 32-point module



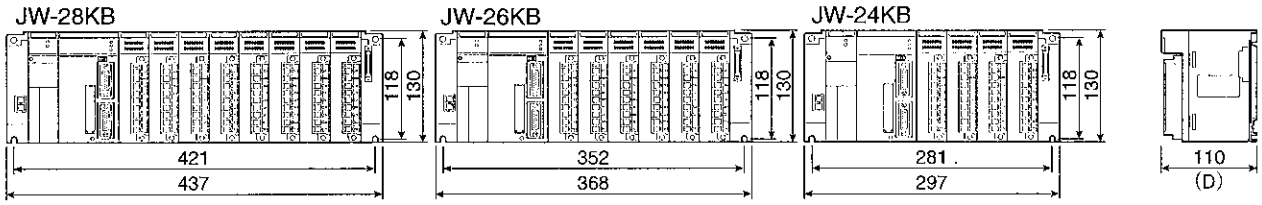
• 64-point module (special I/O)



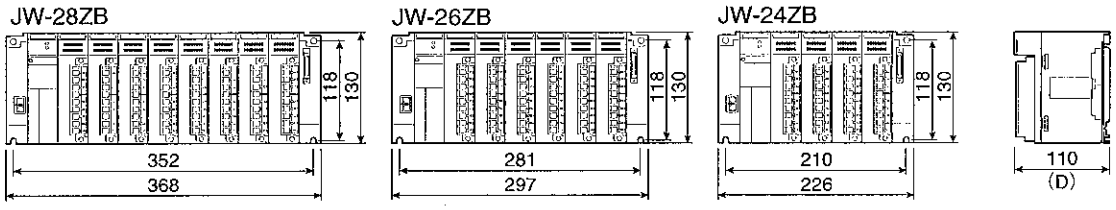
For special I/O, I/O link, and option module in detail, see respective instruction manuals.

[6] Module's installation drawings on basic/expansion rack panel

• Installation drawing on basic rack panel



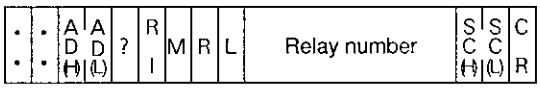
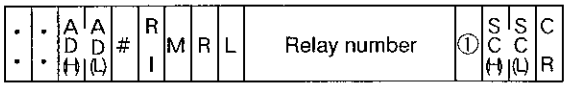
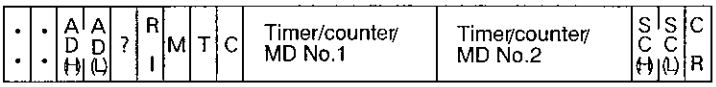
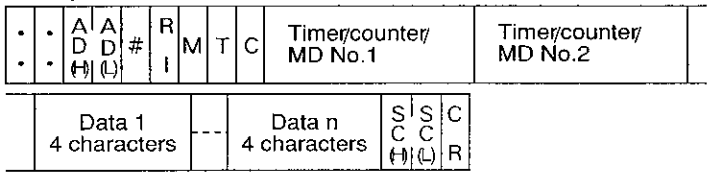
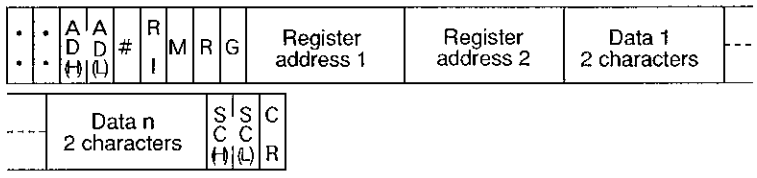
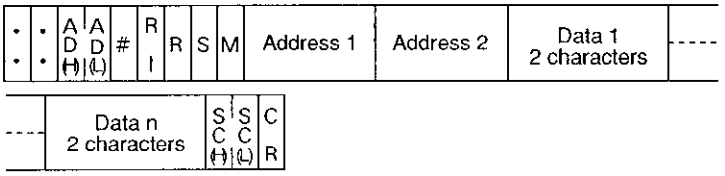
• Installation drawing on expansion rack panel

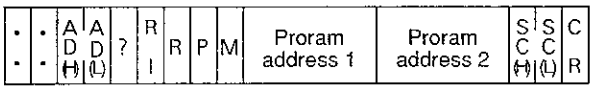
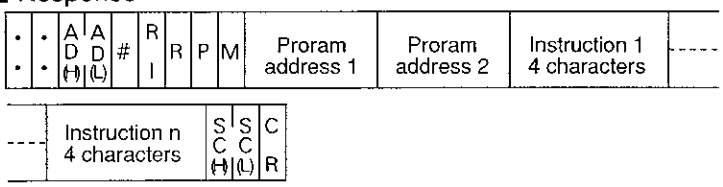
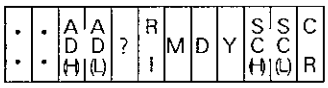
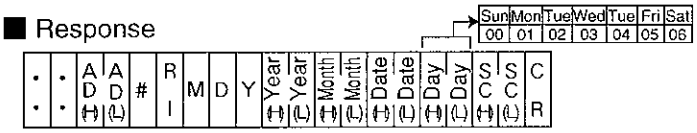
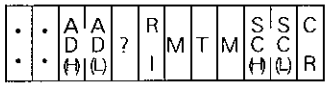
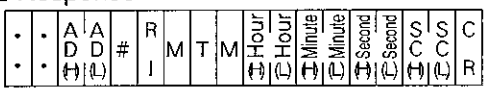


Note: When module cover JW-20CV (ordered separately) is installed on the I/O module etc., D (dimension) will increase 2.5 mm.

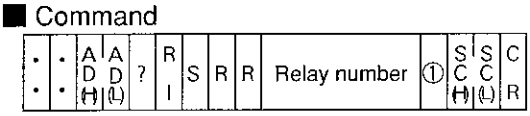
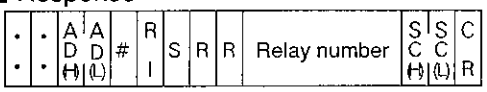
4. Command table for communication port (see page 56)

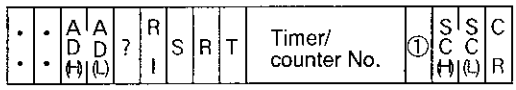
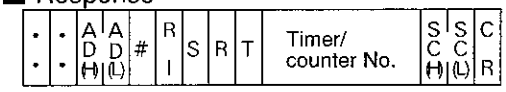
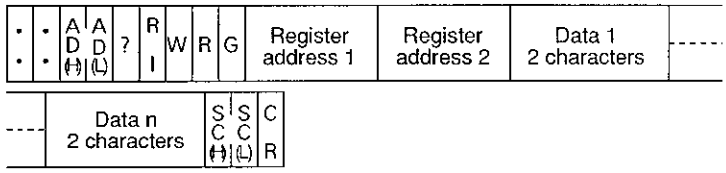
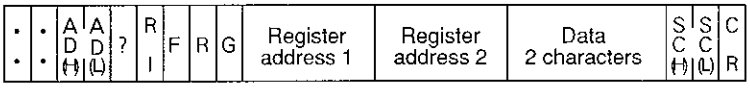
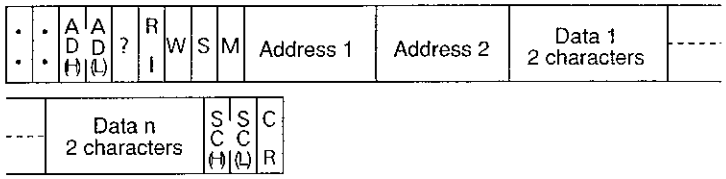
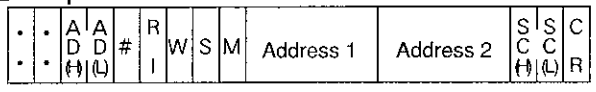
[1] Read out command

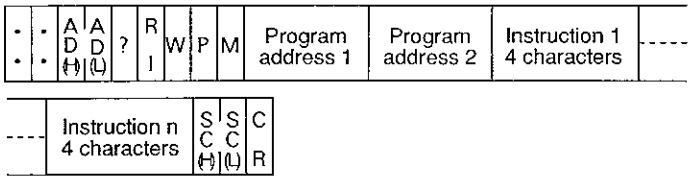
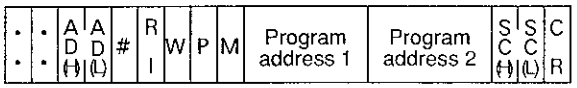
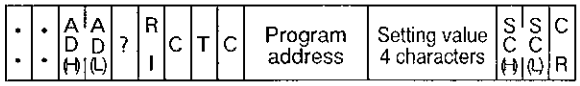
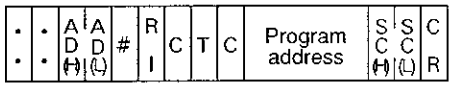
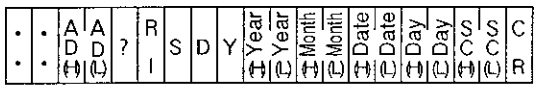
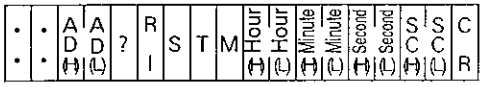
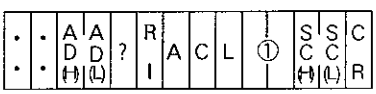
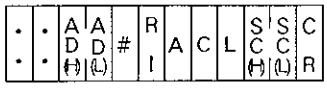
Function	Command name	Communication format
Relay monitor	MRL	Monitor ON/OFF state of the designated relay. ■ Command  ■ Response  Setting of ① 0 : OFF 1 : ON
Current value monitor of timer/ counter/MD	MTC	Monitor current value of timer/counter/MD number 1 to 2. ■ Command  ■ Response 
Register current value monitor	MRG	Monitor current value of register address 1 to 2. ■ Command  ■ Response 
Read out system memory	RSM	Read out contents of system memory address 1 to 2. ■ Command  ■ Response 

Function	Command name	Communication format
Read out program memory	RPM	Read out contents in the program memory address 1 to 2. ■ Command  ■ Response 
Read out date	MDY	Read out data of clock. ■ Command  ■ Response 
Read out time	MTM	Read out time of clock. ■ Command  ■ Response 

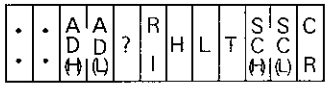
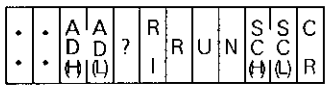
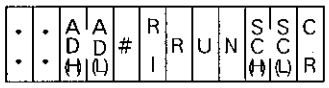
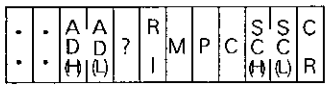
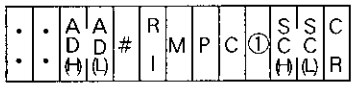
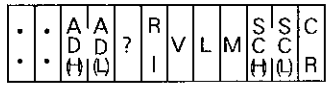
[2] Write command

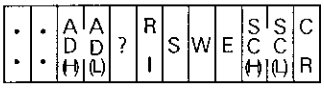
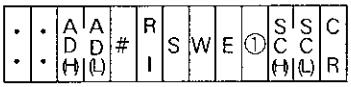
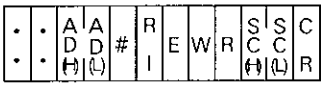
Function	Command name	Communication format
Set/reset relay	SRR	Set/reset the relay. ■ Command  Setting of ① 0 : OFF 1 : ON ■ Response 

Function	Command name	Communication format
Set/reset timer/ counter	SRT	Set timer/counter (time-up, count-up) or reset (return to setting value) ■ Command  Setting of ① 0 : Reset 1 : Set ■ Response 
Write in register	WRG	Write required data from the register address 1 to 2 in the register. ■ Command  ■ Response 
Write the same data in register	FRG	Write the same data in the register address 1 to 2 in the register. ■ Command  ■ Response 
Write in system memory	WSM	Write data in the system memory address 1 to 2. ■ Command  ■ Response 

Function	Command name	Communication format
Write in program memory	WPM	Write instruction in the program address 1 to 2. ■ Command  ■ Response 
Change setting value of timer/ counter	CTC	Change timer/counter setting value in designated program address. ■ Command  ■ Response 
Set date	SDY	Set date of clock. ■ Command  ■ Response 
Set time	STM	Set time of clock. ■ Command  ■ Response 
Set correct of time	ACL	Set correct of time. ■ Command  Setting of ① 00: Start clock 01: Stop clock 08: 30 sec. correction ■ Response 

[3] Control command

Function	Command name	Communication format
Stop operation	HLT	Stop operation. ■ Command  ■ Response 
Restart operation	RUN	Release HLT (stop operation) command, restart operation. ■ Command  ■ Response 
Monitor operational condition	MPC	Monitor PC is running or stops. ■ Command  ■ Response  Contents of ① 0 : Running. 1 : Stop by other optional device. 2 : Stop by HLT command
Read out memory capacity	VLM	Read out program capacity and file capacity. ■ Command  ■ Response  Contents of ① (program capacity) X : 3.5K words O : 7.5K words

Function	Command name	Communication format
Read out write mode status	SWE	Read out current write mode status. ■ Command  ■ Response  Contents of ① 0 : Write prohibited for all memories 1 : Write enable only for data memory. 2 : Write enable for all memories.
Set write mode	EWR	Set write mode. ■ Command  ■ Response  Contents of ① 0 : Write prohibited for all memories 1 : Write enable only for data memory. 2 : Write enable for all memories.

SHARP

SHARP MANUFACTURING SYSTEMS CORPORATION

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